Draft - December 2002

DRAFT ECONOMIC IMPACT ANALYSIS OF PROPOSED CRITICAL HABITAT FOR THREATENED AND ENDANGERED PLANTS ON THE ISLAND OF HAWAI‘I

December 2002

Draft - December 2002

Prepared for:

Division of Economics
U.S. Fish and Wildlife Service
4401 N. Fairfax Drive
Arlington, VA 22203

Prepared by:

Research Solutions, LLC
Honolulu, HI

and

Shalini Gopalakrishnan
Honolulu, HI

Under subcontract to:

Industrial Economics, Incorporated
2067 Massachusetts Avenue
Cambridge, Massachusetts 02140

Send comments on the economic analysis to:

Field Supervisor
Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
P.O. Box 50088
Honolulu HI 96850-0001

TABLE OF CONTENTS

Tables

FOREWORD

1. CONTENT AND PURPOSE

This report assesses the economic impacts that may result from the designation of critical habitat for threatened and endangered plants on the island of Hawai‘i in the State of Hawai‘i. It was prepared for the U.S. Fish and Wildlife Service (the Service) to help them in their decision regarding designating critical habitat for the plant species.

As required by the Endangered Species Act, as amended (the Act), the decision to designate a particular area as critical habitat must take into account the potential economic impact of the critical habitat designation. If the economic analysis reveals that the economic impacts of designating any area as critical habitat outweigh the benefits of designation, then the Service may exclude the area from consideration, unless excluding the area will result in the extinction of the species.

The focus of the economic analysis is on section 7(a)(2) of the Act which requires consultation with the Service and possible project modification for certain projects and activities that may affect a species listed as threatened or endangered, or the habitat of a listed species. The consultations and possible project modifications will have economic impacts which, in this report, are referred to as "section 7 economic impacts" to distinguish them from the economic impacts related to other sections of the Act. Other sections of the Act are outside the scope of this economic analysis.

2. ORGANIZATION

This report is organized into six chapters:

— Chapter I: The Listed Plants and Proposed Critical Habitat

This chapter provides relevant information on the listed plants and the proposed critical habitat units.

— Chapter II: Physical and Socioeconomic Profile of Hawai‘i County

To provide the context for evaluating the economic impacts of the proposed critical habitat designation, this chapter presents a physical description of the island of Hawai‘i, and the socioeconomic profile of Hawai‘i County.

— Chapter III: The Endangered Species Act

Relevant information from the Act is presented in Chapter III, including the role of critical habitat designation in protecting threatened and endangered species, requirements for consulting with the Service, and the definition of taking and other restrictions.

— Chapter IV: Existing Protections

This chapter presents information on existing regulations and land management policies that protect wildlife species or their habitats.

— Chapter V: Approach to the Economic Impact Analysis

This chapter gives the general approach used to estimate section 7 economic impacts of the species listing and the critical habitat designation.

— Chapter VI: Economic Costs and Benefits

This chapter discusses planned projects, activities and land uses in the proposed critical habitat units and estimates section 7 economic costs and benefits. This chapter also identifies the effects which can be attributable solely to the critical-habitat provisions of section 7.

After learning about the proposed critical habitat (Chapter I), readers who are already familiar with Hawai‘i County (Chapter II), the Act (Chapter III), existing protections (Chapter IV), or the approach to conducting the economic analysis (Chapter V) may wish to skip these chapters, as appropriate, and proceed to the economic analysis (Chapter VI).

3. TERMINOLOGY

The following Service terminology is *italicized* throughout this document for the benefit of readers who are unfamiliar with it and want to be reminded that the Service has given specific meanings to these words and terms: *Federal involvement, Federal nexus, occupied, unoccupied*, *primary constituent elements, jeopardy, adverse modification,* and *take.* The terms are explained in the body of the report.

4. ECONOMIC CONSULTANTS

The analysis was performed by Research Solutions, LLC and Shalini Gopalakrishnan, both based in Honolulu, Hawai‘i, under subcontract to Industrial Economics, Inc (IEc), an economic consulting firm in Cambridge, Massachusetts (IEc). In conducting the analysis, Research Solutions and Ms. Gopalakrishnan worked in Hawai‘i with the Service and with Hawai‘i government agencies, companies, and organizations listed in the References. Decision Analysts Hawai‘i, Inc. (DAHI)–a Hawai‘i based economic consulting firm under subcontract to IEc–conducted similar analyses for other species in Hawai‘i and provided advice and assistance to Research Solutions and Ms. Gopalakrishnan on this report.

EXECUTIVE SUMMARY

1. INTRODUCTION

The purpose of this report is to identify and analyze the potential economic impacts that would result from the proposed critical habitat designation for the threatened and endangered plant species on the Island of Hawai'i (the Big Island). Section 4(b)(2) of the Endangered Species Act (the Act) requires the Service to designate critical habitat on the basis of the best scientific and commercial data available after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas within critical habitat, provided the exclusion will not result in extinction of the species.

The focus of this economic analysis is on section 7(a)(2) of the Act, which requires Federal agencies to insure that any action authorized, funded, or carried out by the Federal government is not likely to *jeopardize* the continued existence of any endangered or threatened species or result in the destruction or *adverse modification* of critical habitat. Federal agencies are required to consult with the Service whenever they propose a discretionary action that may affect a listed species or its designated critical habitat. Aside from the protection that is provided under section 7, the Act does not provide other forms of regulatory protection to lands designated as critical habitat. Because consultation under section 7 only applies to activities that involve Federal permits, funding or involvement, the designation of critical habitat will not afford any additional regulatory protections under the Act with respect to strictly private activities. This analysis does not address impacts associated with implementation of other sections of the Act.

2. PROPOSED CRITICAL HABITAT DESIGNATION

The Service is proposing 28 critical habitat units on the Big Island. Five of these units are divided into 19 subunits. Thus, the total number of units and subunits on the Big Island is 42. Combined, these units cover roughly 437,300 acres, most of which are in uninhabited or sparsely inhabited areas.[1]

3. ECONOMIC IMPACTS

For most of the area proposed to be designated as critical habitat, the direct implementation of the section 7 listing and critical habitat provisions of the Act would have moderate economic costs; the indirect economic costs associated with critical habitat have the potential to be significant; and while the benefits associated with critical habitat are best expressed in biological terms, there is likely be an increase in economic activity in certain sectors on the Big Island associated with the implementation of critical habitat for the plants.

---

[1] This acreage estimate overstates the actual critical habitat acreage because it includes "unmapped holes," including the Kohanaiki Business Park and the existing manmade features and structures discussed in Chapter I, Section 2.b.

Relatively few new developments, projects, land uses, and activities are expected to take place in a large percentage of the proposed critical habitat. This is due to (1) lands that are largely unsuitable for development and most other activities because of their rough terrain, difficult access, limited infrastructure, and remote locations; and (2) existing land-use controls that severely limit development and most other activities in parts of the proposed designation. Also, a number of projects and activities in the proposed critical habitat would not be subject to section 7 consultation either because there is no *Federal involvement,* the activities involve operation and maintenance of existing man-made features and structures, or the projects and activities would not impact the *primary constituent elements* essential to the survival and conservation of the plants.

However, portions of the critical habitat units support or are planned to support developments, projects land uses, and activities that are consistent with existing land-use controls, have *Federal involvement*, and are likely to affect the *primary constituent elements* for the plants. These projects and activities, as well as the associated direct section 7-related economic costs, are summarized in Table ES-1.

As shown in Table ES-1, over a 10-year time period the total direct section 7-related costs associated with the plant listings and critical habitat are $53.2 million to $71.8 million. The majority of these costs are attributable to anticipated project modifications associated with military activities at PTA in the northern portion of Unit AA ($30.7 million to $41.1 million), the Saddle Road Project in the northern portions of Unit AA and G ($7.1 million to $8 million), and the three road projects north of Kailua-Kona in Units Y1 and Y2 ($10.7 million to $15.7 million). Most of the direct consultation and project modification costs (approximately 90 percent) will be borne by the Service and other Federal agencies. The discounted present value of all of the 10-year direct section 7-related costs is $37.3 million to $50.4 million, and the annualized cost is $5.3 million to $7.2 million.[2] The annualized costs represent, in the worst case, about 0.23 percent of the total personal income of Hawai‘i County in 2000.

The potential indirect costs could be substantially larger than the direct section 7-related costs. While the probability of occurrence for most of the indirect effects is undetermined, the costs associated with these effects, were they to occur, may be large. Most of the potential indirect costs are associated with Units Y1 and Y2 (due to the significant amount of planned development and high property values); Unit Z (due to the value of the area for hunting and planned development); Unit AA (due to the value of the area to the military and for hunting); the portions of the units that contain important agricultural land; and the portions of the units that are potentially developable. Critical habitat could also have significant but unquantifiable political and social costs in Unit Y2 (due to the potential loss of affordable housing and revenues to provide care for Native Hawaiian orphans and destitute children) and national security impacts in Unit AA (due to potential restrictions in training exercises at Pohakuloa Training Area). In a worst-case (i.e., a highest cost) scenario that is <u>not</u> anticipated to occur where all ungulates are removed from critical habitat, all of the land is redistricted to the Conservation District, conservation management is mandated for all of critical habitat, and the Army is unable to continue with transformation projects, the total 10 year indirect cost would range from $1.2 billion to $1.5 billion. However, the probability that the worst-case scenario will occur is undetermined. Thus, the expected value of the indirect cost of critical habitat is not estimated.

---

[2] Present value and annualized calculations are based on the OMB prescribed seven percent discount rate and the assumption that total costs are distributed evenly over the entire period of analysis.

Designation of the proposed critical habitat and related actions taken to control threats to the plant species (e.g., ungulate control) may also generate economic benefits. These benefits may be related directly or indirectly to critical habitat and manifest in increased economic activity on the Big Island or social welfare. For the former, to the extent that critical habitat designation leads to additional conservation management activities and project modification expenditures funded by out-of-state sources, a local increase in economic activity may result. For the latter, species preservation and recovery and other complementary ecological improvements may generate social welfare benefits for residents and non-residents alike. However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the lack of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the endangered plants will be present in the area); and 2) quantified data on the value of the Big Island species. As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Instead, categories of benefits are discussed in qualitative terms.

Table ES-1. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal M = million

Item	Low	High	Explanation
DIRECT SECTION 7 COSTS			
Management of Game Hunting			
State-Managed Lands, Consultations	$ 6,440	$ 21,260	Consultation due to Pittman-Robertson funding
State-Managed Lands, PMs	$ 36,670	$ 61,600	Based on prior PMs
Residential Development			
Department of Hawaiian Homelands, Consultations	$ 70,200	$ 84,500	Consultation due to Fed funding
Department of Hawaiian Homelands, PMs	Minor	Minor	Low-density planning, so can avoid CH
Villages at La'i'opua	None	None	No Fed involvement
Other Residential Development	None	None	No Fed involvement
Industrial and Commercial Development			
Keahuolu Project	None	None	No Fed involvement
Kohanaiki Business Park Expansion	None	None	No Fed involvement
Kaloko Industrial Park Expansion	None	None	No Fed involvement
Farming and Ranching Operations			
Farm Service Loans, Consultations	$ 48,500	$ 103,000	Consultations due to Fed funding
Farm Service Loans, PMs	Minor	Minor	Major PMs not anticipated
Forestry	None	None	No Fed involvement
Military Activities			
Army, Consultations	$ 3,933,200	$ 5,052,300	Consultation due to Fed funding
Army, PMs	$ 30,700,000	$ 41,100,000	PMs could include: management and relocations of listed plants, threat management, education
National Parks and Wildlife Refuges			
Volcanoes National Park (VNP), Consultations	$ 3,800	$ 7,600	Consultation due to Fed funding
VNP, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
VNP Expansion, Consultations	$ 62,100	$ 62,100	Consultation due to Fed funding
VNP Expansion, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Hakalau National Wildlife Refuge, Consultations	$ 3,800	$ 11,400	Consultation due to Fed funding
Hakalau National Wildlife Refuge, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
State Managed Areas			
Hapuna Beach State Rec Area	None	None	No Fed involvement
Natural Area Reserves (NAR)			
Kipahoehoe NAR, Consultations	$ 5,200	$ 5,200	Consultation due to Fed funding
Kipahoehoe NAR, PMs	None	None	No PMs due to beneficial nature of activities
Pu'u Maka'ala NAR, Consultations	$ 5,200	$ 15,600	Consultation due to Fed funding
Pu'u Maka'ala NAR, PMs	None	None	No PMs due to beneficial nature of activities
Manuka NAR Trail, Consultations	$ 19,600	$ 19,600	Consultation due to Fed funding
Manuka NAR Trail, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Manuka NAR Fencing, Consultations	$ 5,200	$ 5,200	Consultation due to Fed funding
Manuka NAR Fencing, PMs	None	None	No PMs due to beneficial nature of activities
State Forest Reserves			
Fire Management, Consultations	$ 5,200	$ 10,400	Consultation due to Fed funding
Fire Management, PMs	None	None	No PMs due to beneficial nature of activities
Roads			
Existing Roads	None	None	O&M not subject to section 7
New Roads, Consultations			
Saddle Road, Conference/Re-initiation	$ 20,700	$ 20,700	Conference/Re-initiation due to Fed funding
Saddle Road, PMs	$ 7,100,000	$ 8,000,000	PMs could include: avoidance of listed plants, threat management, and conservation set-asides.
Keahole to Keauhou (K-to-K), Consultations	$ 98,600	$ 98,600	Consultation due to Fed funding
K-to-K Region, PMs	$ 10,700,000	$ 15,700,000	PMs could include: avoidance of listed plants, threat management, and conservation set-asides.

Table ES-1. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat, Continued

(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal M = million

Item	Low	High	Explanation
Conservation Projects			
Projects Funded by the Service, Consultations	$ 11,400	$ 22,800	Consultation due to Fed funding
Projects Funded by the Service, PMs	None	None	No PMs due to beneficial nature of activities
USDA Conservation Programs, Consultations	$ -	$ 76,000	Consultation due to Federal funding
USDA Conservation Programs, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Nature Conservancy Projects, Consultations	$ 15,600	$ 31,200	Consultation due to possible Federal funding
Nature Conservancy Projects, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Other Conservation Projects, Consultations	$ 20,800	$ 41,600	Consultation due to possible Federal funding
Other Conservation Projects, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Water Systems			
Potable Water System	None	None	No Fed involvement
Non-potable Water Systems, Consultations	$ 10,100	$ 33,200	Consultation due to possible Fed funding
Non-potable Water System, PMs	None	None	No PMs due to beneficial nature of activities
Fire Management			
Pre Suppression, Consultations	$ 9,700	$ 19,400	Consultation due to Fed funding
Pre Suppression, PMs	None	None	No PMs due to beneficial nature of activities
Fire Suppression, Consultations	$ 52,000	$ 314,000	Consultation due to Fed funding
Fire Suppression, PMs	None	None	No PMs due to beneficial nature of activities
Communications Facilities			
New Facilities, Consultations	$ 13,700	$ 27,300	Consultation due to FCC and/or FAA permits
New Facilities, PMs	-	600,000	Due to additional permits or site relocation costs
Golf Courses	None	None	No Fed involvement
State Trail and Access System			
Consultations	$ 5,200	$ 5,200	Consultation due to Fed funding
PMs	None	None	PMs not anticipated
Drug Enforcement			
Consultations	$ 5,200	$ 31,400	Consultation due to DEA funding
PMs	187,500	225,000	Due to cost of biological monitor
Natural Disasters			
FEMA Recovery Projects, Consultations	$ 3,800	$ 7,500	Consultation due to FEMA funding
FEMA Recovery Projects, PMs	Minor	Minor	Few adverse impacts anticipated
USDA Disaster Assistance, Consultations	$ 3,800	$ 7,500	Consultation due to USDA funding
USDA Disaster Assistance, PMs	Minor	Minor	Few adverse impacts anticipated
Ecotourism	None	None	No Fed involvement
TOTAL DIRECT COSTS			
Direct	**$ 53,163,210**	**$ 71,821,160**	Total may understate economic impact because the cost of "minor" project modifications are not included
Discounted Present Value	**$ 37,339,614**	**$ 50,444,177**	Present value and annualized calculations are based on the OMB prescribed seven percent discount rate and the assumption that total costs are distributed evenly over the entire period of analysis.
Annualized	**$ 5,316,321**	**$ 7,182,116**	

Table ES-1. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat, Continued

(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal M = million

Item	Explanation and Worst- or Best- Case Scenario Estimates
INDIRECT COSTS *	
Management of Game Mammals & Loss of Hunting Lands	Small probability of a 10 year loss of $13 M in direct sales, $23M in total direct and indirect sales, $7.6 M in income, and $6.8 M in hunter benefits. Additional losses include the value of the hunting meat to the hunters and their families and the social and cultural value of hunting to the community.
Redistricting of Land by the State	Redistricting or the risk of redistricting could lead to a loss of an undetermined percentage of $300 M to $400 M, plus unquantifiable political and social impacts.
Conservation Management	Low probability of a loss of $250 M to $430 M, plus the loss of the value of the hunting meat to the hunters and their families and the social and cultural value of hunting to the community.
State and County Development Approvals	Costs of $200,000 to $525,000 prepare an EIS for eight projects. Additional costs to projects range from insignificant to substantial.
Reduced Property Values	Loss of undetermined percentage of $115 M to $205 M in property values.
Subsistence and Native Hawaiian Practices	Slight probability of a moderate impact.
Military Readiness	Undetermined probability of a loss of $693 M and an undetermined increase in the probability that the Army could leave Hawai'i
Condemnation of Property	No condemnation resulting from CH. Also, the Service acquires land by negotiation, not condemnation.
Investigate Implications of CH	84 private landowners may investigate the implications of CH on their lands at a cost of $273,000 to $798,000
Loss of Conservation Projects	Some landowners want to avoid CH designation
DIRECT BENEFITS	
Regional Economic Activity	
Medical/Pharmaceutical Benefits	Probability of medical/pharmaceutical value unknown
Conservation Management	Low probability of conservation management which could lead to an expansion of Hawai'i's economy by an undetermined percentage of $358 M to $675 M over 10 years.
Project modifications	Expansion of Hawai'i's economy by an undetermined percentage of $90 M to $118 M over 10 years.
Ecotourism	Project modifications attributable to critical habitat could enhance the quality of the ecosystem thereby increasing the appeal of ecotourism tours to visitors.
Avoided Cost to Developers	Occupied critical habitat helps developers site projects
Social Welfare Benefits of Habitat Designation	Critical habitat not anticipated to significantly add to the preservation of open space
INDIRECT BENEFITS	
Benefits of Endangered Species Preservation	Difficult to estimate preservation benefits and their value
Benefits of Broader Ecological Improvements	Difficult to determine environmental improvements attributable to the implementation of section 7

*** Although the analysis does provide general estimates of some of the potential indirect costs, these estimates are not totaled because of the speculative nature of many of these costs. Instead, this table reports qualitatively on their likelihood and quantitatively on their potential magnitude. For additional information on any of these indirect impacts, the reader should refer to the economic cost and benefit chapter of the analysis (Chapter 6).**

THE LISTED PLANTS AND PROPOSED CRITICAL HABITAT[3] CHAPTER I

Under the Endangered Species Act of 1973, as amended (the Act), the United States Department of the Interior, Fish and Wildlife Service (the Service) proposes to designate critical habitat for threatened and endangered plant species on the Island of Hawai'i (the Big Island) in the State of Hawai'i. This chapter provides information on the listed plants and the proposed critical habitat units, most of which comes from the document "Endangered and Threatened Wildlife and Plants; Designations of Critical Habitat for the Plant Species From the Island of Hawai'i, HI; Proposed Rule" (the proposed rule), published in the *Federal Register* on May 28, 2002 (67 FR 36968). In addition, the Service provided valuable information for this chapter in the form of overlay resource maps and detailed acreage data.

1. THE LISTED PLANTS

The Service proposes critical habitat for 47 threatened and endangered plant species on the Big Island. The proposed rule contains a detailed discussion of the plant taxa, including taxonomy, ecology, habitat requirements, historical and current distribution and threats for each of these species.

2. PROPOSED CRITICAL HABITAT UNITS

The Service is proposing 28 critical habitat units on the Big Island. Five of these units are divided into 19 subunits. Thus, the total number of units and subunits (referred to throughout this report as "units") on the Big Island is 42. Based on the proposed rule and other sources, this chapter and Table I-1 provide information on the units, including the *primary constituent elements* essential for the conservation of each plant species, excluded features and structures, acreages, general location and terrain, land ownership, and existing land management. The proposed rule provides detailed information on the critical habitat boundaries and the map coordinates of boundary points.

2.a. Primary Constituent Elements

Each of the proposed critical habitat units provides one or more of the *primary constituent elements* essential for the conservation of the plant species. The Service defines *primary constituent elements* on the basis of the habitat features of the areas where the plant species are reported.

---

[3] **Note to Reader:** After learning about the proposed critical habitat in this chapter, readers who are already familiar with Hawai'i County (Chapter II), the Act (Chapter III), existing protections (Chapter IV), or the methodology for conducting the economic analysis (Chapter V) may wish to skip these chapters, as appropriate, and proceed to the analysis of economic impacts (Chapter VI).

Habitat features include the type of plant community, associated native plant species, locale (e.g., steep rocky cliffs, talus slopes, stream banks), and elevation.

2.b Excluded Features and Structures

As indicated in the proposed rule, existing manmade features and structures do not contain, and are not likely to develop, *primary constituent elements*. The proposed rule states:

> "Existing features and structures within proposed areas, such as buildings, roads, aqueducts, telecommunication equipment, arboreta and gardens, heiaus (indigenous place of worship, shrine), airports, other paved areas, lawns, and other rural residential landscaped areas do not contain one or more of the primary constituent elements described for each species… and are not included in the critical habitat designation." (67 FR 37076)

As a result, the Service considers these features and structures to be excluded from the proposed critical habitat as "unmapped holes." In addition to such man-made features and structures listed in the proposed rule, the Service has identified additional ones that do not contain *primary constituent elements*. Below is a comprehensive list of man-made features and structures that will be excluded to the extent that they lack the *primary constituent elements* (these will be addressed in the text of the final rule):

- Airports
- Aqueducts
- Arboreta and gardens
- Buildings
- Campgrounds, shelters, and cabins
- Cultural features such as ruins and ancient canoe moorings
- Electrical utility transmission and distribution facilities (e.g., towers, poles, guy wires, conductors, and other appurtenances) or their associated rights of way and access ways
- Heiau (indigenous places of worship or shrines)
- Hiking trails and unpaved roads
- Lawns and other rural residential landscaped areas
- Missile launch sites
- Other paved areas
- Radars
- Roads
- Scenic lookouts and monuments
- Sites of current or historical use as a quarry, gravel pit, or borrow pit
- Telecommunications equipment
- Telemetry antennas
- Water system features (including, but not limited to, wells, tanks, tunnels, pipelines, ditches, reservoirs, pumping stations, and gauging stations)

The operation and maintenance of these existing man-made features and structures generally would not be affected by critical habitat designation.

The Service also indicates that certain areas will be removed by revising the critical habitat boundaries in the final rule because they lack *primary constituent elements* (Memorandum to the

Service, Washington Office, from the Service, Honolulu Field Office. October 17, 2002). Specifically, the following area lacks *primary constituent elements* and therefore will be removed by revising the critical habitat boundaries:

- Kohanaiki Business Park (Unit Y1): The lower portion of the Kohanaiki Business Park that has been mass-graded, subdivided, and sold to separate owners.

Because these man-made features and structures will be excluded, they are also excluded from this economic analysis. Henceforth, references to the proposed critical habitat already exclude all features and structures discussed above unless indicated otherwise by footnotes.

2.c Acreage[4]

Table I-1 presents the total acreage proposed for critical habitat designation on the Big Island. The acreage encompassed within the boundaries of the 42 proposed critical habitat units on the Big Island totals approximately 437,300 acres, which is about 17 percent of the island.

2.d Location and Terrain

Significant portions of the critical habitat acreage on the Big Island are in uninhabited or sparsely inhabited remote areas:

- All or large portions of proposed Units A1-2, E, and F, located in the northern and eastern part of the island, are in watershed areas with streams, cinder- cones, heavy forestation, lava flows and steep gulches. The climate is very wet in these areas with high annual rainfall.

- Portions of Unit B are not easily accessible and include steep, mountainous terrain. The climate is very wet in this area with high annual rainfall.

- Some portions of Units K and L are remote and only accessible by foot trails. The climate in these areas is moderate with medium to low annual rainfall.

Other units are relatively more accessible and subject to limited human use, including hiking and grazing. However, due to their remoteness from population centers and rugged terrain, they remain sparsely inhabited by permanent residents:

- Units C, M1-5, N1-2, and portions of BB are coastal areas of the island located near beaches and relatively accessible by road. In Units M1-M5 on the eastern side of the island, the climate is very wet with high annual rainfall. However, Units C, BB, and N1-2 on the western and southern sides of the island have an extremely dry climate with very low annual rainfall.

[4] These acreage estimates overstate the actual critical habitat acreage because they include "unmapped holes," including the Kohanaiki Business Park and the existing manmade features and structures discussed in Chapter I, Section 2.b.

- Units G, H, I, J, K, and L are located on the on the eastern side of the island and include watershed areas, extensive surrounding lava flows, forests, cinder-cones and lava-tubes. Most sections of these units are accessible by paved road or jeep trail. Units G and J have moderate to wet climate with medium to high annual rainfall. Units H and I, which are more inland and at higher elevations, have a dry climate with low annual rainfall. Unit L has a climate that is moderate with medium to low annual rainfall. Unit K has a moderate to dry climate with medium to low annual rainfall.

- Units O, P and Q, in the southern part of the island, have a level terrain with lava flows and lava tubes. These units have a moderate to dry climate with medium to low annual rainfall.

- Unit R and portions of Unit V, on the western side of the island, have relatively level terrain and are suitable for grazing. The climate for Unit R is dry with low annual rainfall. The climate for Unit V is moderate with medium annual rainfall.

- Units U, X and portions of Unit V, on the western side of the island, have level terrain, portions of which are heavily forested. Climate in Unit U is dry with low annual rainfall. The climate in Units V and X is moderate with medium annual rainfall.

- Units D1-8 are located inland in the northern part of the island and are primarily cinder cones in pasture land that are accessible by roads or jeep trails. The climate in these units is dry with low annual rainfall.

- Unit S and T, on the western side of the island, include level terrain and lava flows. The climate in these units is dry with low annual rainfall.

- Units W and Z, on the western side of the island, contain cinder-cones, but no other major natural features. The climate in these units is dry with low annual rainfall numbers.

- Unit AA overlaps extensively with the Pohakuloa Training Area, which is located in roughly the center of the island. The land includes extensive lava flows, gulches, cinder-cones and is used for military exercises. The climate in this unit is dry with extremely low annual rainfall numbers.

Some units are located adjacent to a heavily developed and populated urban center. Specifically, Units Y1 and Y2, located on the western side of the island, near the urban center of Kona, are flat lava beds with sparse vegetation in the midst of a commercial area and adjacent to several major roads. Units Y1-2 have an extremely dry climate with very low annual rainfall.

Detailed maps appear in the proposed rule.

2.e. *Occupied* and *Unoccupied* Units

The Service considers about 82,486 (19 percent) of the proposed critical habitat on the Big Island to be *occupied* by the listed plant species and 354,813 acres (81 percent) to be *unoccupied.* The *unoccupied* areas were included in the proposed designation because the Service believes that they are necessary to provide for the long-term survival and conservation of the species.[5]

2.f. Land Ownership

Approximately 142,600 acres (33 percent) proposed as critical habitat on the Big Island are owned by the Federal government. The State owns about 217,917 acres (50 percent) of this area. The State Department of Hawaiian Homelands owns 5,405 acres (one percent) of this area. The County of Hawai'i owns 11 acres (less than one percent) of this area. Major private landowners own 69,926 acres (16 percent) of this area. Minor private landowners own 1,055 acres (less than one percent) of this area. Finally, State and county roads account for 383 acres of this area.

2.g. Existing Land Management

Land in the proposed critical habitat is subject to a variety of existing regulations and land-management programs that already limit activities in those areas. These include Federal programs, State land-use controls and programs, county land-use controls and land management by various public and private organizations. The regulations and land-management programs are described in Chapter IV.

Table I-1 at the end of this chapter identifies the amount of acreage under each type of control or management. Since some of the managed areas overlap with one another (e.g., portions of State Hunting Units are in State Forest Reserves), the percentages in Table I-1 do not always sum to 100 percent.

As indicated in the table, approximately 116,922 acres (27 percent) of the proposed critical habitat are controlled by Federal government as part of Hawai'i Volcanoes National Park. The Hakalau Forest National Wildlife Refuge, also managed by the Federal government, is 25,556 acres (six percent) of the proposed critical habitat. Also federally managed is the Pohakuloa Training Area, consisting of 53,814 acres (12 percent) of the proposed critical habitat.

At the State level, 366,884 acres (84 percent) of the proposed critical habitat is in the State Conservation District. The Conservation District is subject to State control or management, and development and commercial activity is generally limited within the Conservation District with varying levels of restrictions based on the applicable Subzone (see Chapter IV for full discussion).

In addition to the State restrictions that are placed on land in the Conservation District, some of this land is managed by the State as follows: 88,713 acres (20 percent of the proposed designation) are in State Forest Reserves; 31,489 acres (seven percent) are in State Natural Area Reserves (NARs); 3,134 acres (one percent) is in a State Wildlife Sanctuary; 31 acres (less than one percent) are in State Recreation Areas; and 34 acres (less than one percent) are in State Parks.

---

[5] These acreage estimates overstate the actual critical habitat acreage because it includes "unmapped holes," including the Kohanaiki Business Park and the existing manmade features and structures discussed in Chapter I, Section 2.b.

Approximately 185,373 acres (42 percent of the proposed designation) are in State Hunting Units, large areas managed for public hunting. (See Chapter IV for full discussion of these management areas).

While the State manages land in the Conservation District, the County of Hawai‘i has primary responsibility for land in the other districts--namely, the Agricultural, Urban and Rural Districts. These three Districts are subject to county land-use and development controls, including county community plans, zoning, and building code regulations affecting farm, residential, commercial, and industrial development and use. Of the proposed critical habitat designation, approximately 69,518 acres (16 percent of the proposed designation) are in the Agricultural District, 899 acres (less than one percent) are in the Urban District, and none are in the Rural District.

Table I-1. Critical Habitat Units, Big Island Plants: Acreage, Location, Ownership, Land Management, Improvements and Activities

Item	Units	All Units				Unit A1	Unit A2	Unit B	Unit C	Unit D[2]	Unit E
		Occupied	Unoccupied	Total	Share						
Total Area[1]		82,486	354,813	437,299		1,777	6,635	20,263	94	1,305	7,393
Land Ownership											
Federal	Acres	8,529	134,071	142,600	33%	-	-	-	-	-	3,399
State	Acres	63,977	153,940	217,917	50%	1,280	4,395	11,215	91	-	3,081
State DHHL	Acres	881	4,524	5,405	1%	-	-	2,889	-	-	786
County	Acres	1	9	11	0%	-	-	-	-	-	-
Private, Major Owner	Acres	8,853	61,073	69,926	16%	498	2,179	5,596	-	1,305	11
Private, Minor Owners	Acres	130	925	1,055	0%	0	61	488	0	-	117
State/County Roads	Acres	116	267	383	0%	-	-	75	3	-	-
Federally Controlled or Managed											
National Park	Acres	6,732	110,189	116,922	27%	-	-	-	-	-	-
National Wildlife Refuge	Acres	1,795	23,761	25,556	6%	-	-	-	-	-	3,418
Pohakuloa Training Area	Acres	17,117	36,696	53,814	12%	-	-	-	-	-	-
FWS, non-plant populations	Count	-	-	-						-	
State-Controlled or Managed											
Conservation District	Acres	61,633	305,252	366,884	84%	1,746	6,635	10,111	94	-	3,184
Protective	Acres	16,693	89,782	106,475	24%	-	5,771	10,111	-	-	-
Limited	Acres	15,213	10,504	25,717	6%	921	749	-	-	-	-
Resource	Acres	28,545	200,987	229,533	52%	824	115	-	94	-	3,184
General	Acres	537	2,543	3,081	1%	-	-	-	-	-	-
Special	Acres	644	1,435	2,079	0%	-	-	-	-	-	-
Forest Reserves	Acres	14,028	74,684	88,713	20%	1,259	3,635	9,288	-	-	3,070
State Hunting Units	Acres	50,507	134,866	185,373	42%	1,259	3,635	9,288	-	-	3,070
Natural Area Reserves (NARs)	Acres	11,442	20,047	31,489	7%	-	-	-	-	-	-
State Recreation Area	Acres	31	-	31	0%	-	-	-	18	-	-
State Parks	Acres	29	5	34	0%	-	-	-	-	-	-
State Wildlife Sanctuary	Acres	548	2,585	3,134	1%	-	-	-	-	-	-
County-Controlled or Managed											
Agricultural District	Acres	20,738	48,780	69,518	16%	32	-	10,152	-	1,305	4,209
Urban District	Acres	117	782	899	0%	-	-	-	0	-	-
Special Management Area	Present	N/A	N/A	N/A	N/A	yes	yes	-	yes	-	-

Note: Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.

1: This acreage estimate overstates the actual critical habitat acreage because it includes "unmapped holes," including the Kohanaiki Business Park in Unit Y1, and the existing manmade features and structures discussed in Chapter I, Section 2.b.

2: The subunits in Unit D were combined due to their similar characteristics

Table I-1. Critical Habitat Units, Big Island Plants: Acreage, Location, Ownership, Land Management, Improvements and Activities

Item	Units	Unit F	Unit G	Unit H	Unit I	Unit J	Unit K	Unit L	Unit M1	Unit M2	Unit M3	Unit M4	Unit M5
Total Area[1]		34,363	79,780	13,151	1,290	12,516	37,792	95,148	46	328	349	347	1,315
Land Ownership													
Federal	Acres	20,561	8,980	9,563	1,269	647	-	95,145	-	-	-	-	1,315
State	Acres	11,378	54,936	113	-	10,636	21,601	0	-	218	254	340	-
State DHHL	Acres	86	6	-	-	-	-	-	46	104	-	-	-
County	Acres	-	2	-	-	-	-	-	-	-	8	-	-
Private, Major Owner	Acres	2,338	15,760	3,475	20	1,233	16,190	-	-	-	40	-	-
Private, Minor Owners	Acres	0	0	-	-	-	-	-	-	-	32	-	-
State/County Roads	Acres	-	95	-	-	-	-	-	-	6	15	8	-
Federally Controlled or Managed													
National Park	Acres	-	8,980	9,563	1,269	647	-	95,148	-	-	-	-	1,316
National Wildlife Refuge	Acres	20,618	-	-	-	-	-	-	-	-	-	-	-
Pohakuloa Training Area	Acres	-	-	-	-	-	-	-	-	-	-	-	-
FWS, non-plant populations	Count												
State-Controlled or Managed													
Conservation District	Acres	29,784	71,348	12,849	1,269	12,516	37,411	88,865	45	157	294	224	1,316
Protective	Acres	5,869	46,185	3,259	-	1,233	29,293	-	-	-	120	-	-
Limited	Acres	1	-	-	-	10,636	-	0	-	-	-	-	-
Resource	Acres	23,555	24,409	9,590	1,269	647	8,118	88,865	45	157	174	224	1,316
General	Acres	206	754	-	-	-	-	-	-	-	-	-	-
Special	Acres	153	-	-	-	-	-	-	-	-	-	-	-
Forest Reserves	Acres	5,565	39,553	72	-	-	21,573	-	-	-	219	-	-
State Hunting Units	Acres	11,460	48,721	72	-	7,792	21,573	-	-	-	219	-	-
Natural Area Reserves (NARs)	Acres	5,895	9,168	-	-	7,792	-	-	-	-	-	-	-
State Recreation Area	Acres	-	-	-	-	-	-	-	-	-	13	-	-
State Parks	Acres	-	-	-	-	-	-	-	-	-	-	-	-
State Wildlife Sanctuary	Acres	-	6	-	-	-	-	-	-	-	-	-	-
County-Controlled or Managed													
Agricultural District	Acres	4,579	8,432	302	20	-	381	6,283	1	172	55	123	-
Urban District	Acres	-	-	-	-	-	-	-	-	-	-	-	-
Special Management Area	Present	-	-	-	-	-	-	yes	yes	yes	yes	yes	yes

Note: Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.

Table I-1. Critical Habitat Units, Big Island Plants: Acreage, Location, Ownership, Land Management, Improvements and Activities

Item	Units	Unit N1	Unit N2	Unit O	Unit P	Unit Q	Unit R	Unit S	Unit T	Unit U	Unit V	Unit W	Unit X
Total Area[1]		87	1,090	531	1,351	8,770	955	947	3,680	1,520	2,351	3,654	340
Land Ownership													
Federal	Acres	-	6	-	-	-	-	-	-	1,520	-	-	-
State	Acres	87	38	-	-	7,741	828	868	2,704	-	-	-	340
State DHHL	Acres	-	1,047	441	-	-	-	-	-	-	-	-	-
County	Acres	-	-	-	-	-	-	-	-	-	-	-	-
Private, Major Owner	Acres	-	-	37	1,320	991	111	79	977	-	2,351	3,654	-
Private, Minor Owners	Acres	-	-	52	-	1	14	-	-	-	-	-	-
State/County Roads	Acres	-	-	-	31	37	2	-	-	-	-	-	-
Federally Controlled or Managed													
National Park	Acres	-	-	-	-	-	-	-	-	-	-	-	-
National Wildlife Refuge	Acres	-	-	-	-	-	-	-	-	1,520	-	-	-
Pohakuloa Training Area	Acres	-	-	-	-	-	-	-	-	-	-	-	-
FWS, non-plant populations	Count												
State-Controlled or Managed													
Conservation District	Acres	83	262	-	-	6,475	825	833	3,188	-	1,273	-	340
Protective	Acres	-	-	-	-	-	-	803	490	-	-	-	-
Limited	Acres	-	151	-	-	4	-	0	380	-	-	-	-
Resource	Acres	83	112	-	-	6,471	-	-	1,256	-	-	-	246
General	Acres	-	-	-	-	-	-	30	55	-	1,273	-	-
Special	Acres	-	-	-	-	-	825	-	1,007	-	-	-	94
Forest Reserves	Acres	-	-	-	-	-	834	-	2,702	-	-	-	340
State Hunting Units	Acres	-	-	-	-	7,766	-	868	2,702	-	-	-	340
Natural Area Reserves (NARs)	Acres	-	-	-	-	7,766	-	868	-	-	-	-	-
State Recreation Area	Acres	-	-	-	-	-	-	-	-	-	-	-	-
State Parks	Acres	-	-	-	-	-	-	-	-	-	-	-	-
State Wildlife Sanctuary	Acres	-	-	-	-	-	-	-	-	-	-	-	-
County-Controlled or Managed													
Agricultural District	Acres	4	828	531	1,351	2,295	131	114	492	1,520	1,077	3,654	-
Urban District	Acres	-	-	-	-	-	-	-	-	-	-	-	-
Special Management Area	Present	yes	yes	-	-	-	-	-	-	-	-	-	-

Note: Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.

Table I-1. Critical Habitat Units, Big Island Plants: Acreage, Location, Ownership, Land Management, Improvements and Activities

Item	Units	Unit Y1	Unit Y2	Unit Z	Unit AA	Unit BB
Total Area[1]		524	826	26,535	70,137	106
Land Ownership						
Federal	Acres	-	-	-	196	-
State	Acres	-	472	20,461	64,735	106
State DHHL	Acres	-	-	-	-	-
County	Acres	-	-	-	-	-
Private, Major Owner	Acres	341	344	5,870	5,206	-
Private, Minor Owners	Acres	174	-	113	-	-
State/County Roads	Acres	10	10	91	-	-
Federally Controlled or Managed						
National Park	Acres	-	-	-	-	-
National Wildlife Refuge	Acres	-	-	-	-	-
Pohakuloa Training Area	Acres	-	-	-	53,814	-
FWS, non-plant populations	Count					
State-Controlled or Managed						
Conservation District	Acres	188	0	7,272	68,190	106
Protective	Acres	-	-	432	2,904	5
Limited	Acres	-	-	453	12,421	-
Resource	Acres	-	-	6,012	52,664	101
General	Acres	188	0	375	200	-
Special	Acres	-	-	-	-	-
Forest Reserves	Acres	-	-	-	601	-
State Hunting Units	Acres	-	-	13,102	53,505	-
Natural Area Reserves (NARs)	Acres	-	-	-	-	-
State Recreation Area	Acres	-	-	-	-	-
State Parks	Acres	-	-	-	3	31
State Wildlife Sanctuary	Acres	-	-	3,128	-	-
County-Controlled or Managed						
Agricultural District	Acres	90	174	19,263	1,948	-
Urban District	Acres	247	652	-	-	-
Special Management Area	Present	-	-	-	-	yes

Note: Entries may not sum to totals due to rounding, slight acreage discrepancies, and overlapping land-management areas.

PHYSICAL AND SOCIOECONOMIC PROFILE OF HAWAI'I COUNTY[6] CHAPTER II

To provide context for evaluating the economic impacts of the proposed critical habitat designation, this chapter presents a physical description and socioeconomic profile of the Big Island. A summary of the socioeconomic data is presented in Table II-1.

1. PHYSICAL DESCRIPTION OF THE BIG ISLAND

The Big Island is by far the largest of the eight major islands with an area of 4,039 square miles. The island is nearly twice the size of all the other islands put together.

The southernmost and youngest of the Hawaiian Islands, the Big Island was formed by the activity of five volcanoes: Hualalai, Kohala, Mauna Loa, Mauna Kea and Kilauea. Except for the windward slope of Kohala, the island is little eroded, and the mountains are far taller than the greatest elevations on the other islands. Mauna Loa and Mauna Kea dominate the landscape, comprising 51 percent and 23 percent of the land area respectively, and rising over 13,500 feet in elevation.

Both Mauna Loa and Kilauea are active volcanoes. Since July 1950, volcanic activity on the Big Island has been dominated by frequent and sometimes prolonged eruptions at Kilauea, while only two short-lived eruptions have occurred at Mauna Loa (July 1975 and March-April 1984). As of October 2002, Kilauea's eruption at Pu'u 'O'o, which began in January 1983, shows no signs of decline. Except for the nearly continuous eruptive activity at Halemaumau for a century before 1924, the Pu'u 'O'o eruption has now become the longest lasting single Hawaiian eruption in recorded history.

Moving northward, the remaining volcanoes are dormant or extinct. Last erupting in 1801, Hualalai is the most symmetrical and steepest of the island's volcanic peaks and contains both cinder cones and a number of craters. Mauna Kea is a dormant volcano in its postshield stage and is thought to have last erupted 4,500 years ago. Ash from past eruptions still covers both Mauna Kea and Kohala. The most northerly volcano, Kohala, is also considered extinct, but its cinder cones, now covered with grass, remain recognizable features of the landscape.

[6] **Note to Reader:** Readers who are already familiar with Hawai'i County may wish to skip this chapter and proceed to the next background-information chapters (Chapters III through V), or to the economic analysis (Chapter VI).

With its wide range of elevations and large size, the Big Island exhibits all climate types characteristic of the Hawaiian Islands, as well as some climates characteristic of temperate and high-altitude regions. The cold climate of the summits of Mauna Loa and Mauna Kea regularly produce winter snows.

There is significant variability in rainfall on the island. While the windward side of the island receives an average of 200 to 300 inches per year, the leeward side averages less than 50 inches per year, with some locations receiving fewer than 10 inches a year. The greatest amount of rain does not fall on the summits of Mauna Kea or Mauna Loa, but at elevations of 2,000 to 4,000 feet, due to the presence of the trade-wind inversion layer.

The only perennial streams are found on the northeastern slopes of Mauna Kea and Kohala. The high permeability of the rock forming the younger mountains inhibits the development of streams elsewhere. As a result, large areas on these mountains are devoid of vegetation. The southwestern side of Kilauea is a desert, due to the limited rainfall and the acidity from volcanic gases.

Natural vegetation communities include rain forest, dry forest, arid scrub, upland scrub and alpine stone desert. Much of the eastern side of the island is rain forest, characterized by closed canopy forest often dominated by *ohi'a lehua* and an understory of ferns. Dry land forest communities make up much of the northwestern quarter of the island, the southern tip, and the southern flank of Kilauea. These dry land forests display considerable diversity, tend to be more open than the rain forest, and contain an understory of shrubs, vines, and herbs that show adaptation to drought. Over the past century, little of this natural dry land forest has been urbanized or used for agriculture; instead it has primarily been used for cattle grazing. Arid scrub communities can be found in the lowlands along the northwestern coast and the southern coast. These habitats contain communities of drought-resistant stunted trees and shrubs, such as *wiliwili* and '*ohe*. Upland scrub communities are found encircling the summits of Mauna Kea and Mauna Loa above 5,000 to 6,000 feet, where the influence of trade winds is slight. These communities contain shrubs and low trees that diminish in height and density with elevation, including the rare Hawaiian silversword. Finally, alpine stone desert communities are found only on the peaks of Mauna Loa and Mauna Kea above 10,000 feet. Composed of recent lavas and cinders, these areas are mostly unvegetated, except for the occasional growth of mosses, lichens and drought and cold-resistant herbs.

2. SOCIOECONOMIC PROFILE OF THE BIG ISLAND

Table II-l summarizes economic and demographic information for the County of Hawai'i, which includes all of the Big Island. Estimates and figures presented in this section are taken from the *State of Hawai'i Data Book* (DBEDT, annual), the *County of Hawai'i Data Book* (Department of Research and Development, annual), the *Annual Visitor Research Report* (DBEDT, annual) and *Statistics of Hawai'i Agriculture* (Hawai'i Agricultural Statistics Service, annual).

2.a. Population and Distribution

In the year 2000, the County of Hawai'i had a population of 148,677 residents, up 23.6 percent since the 1990 U.S. census. The total population amounted to 12.3 percent of the State population, the second largest of the four counties (after O'ahu).

The population is geographically dispersed around the island. Hilo is the largest town, with a population of 40,759 (approximately 27 percent of the island's population). The next largest town,

Kailua-Kona, contains fewer than 10,000 people. A brief description of the county districts and their population follows (clockwise):

— Hamakua District (4 percent)

The Hamakua District extends inland from the northern coast to include the summit of Mauna Kea and part of Mauna Loa. Most of the population resides in the coastal area. Until the closure of the Hamakua Sugar Company, sugar production dominated the economy of this district. Much of the former sugarcane land has been replanted as part of a commercial forestry operation.

— North Hilo District (1 percent)

The North Hilo District extends from the coastline inland along the flank of Mauna Kea toward the peak of Mauna Loa and hosts a few small communities. Until the closure of the Hilo Coast Processing Company, sugar production dominated the economy of this district. Macadamia nuts and other diversified crops are now planted in this district.

— South Hilo District (32 percent)

The South Hilo District is located on the windward (eastern) side of the island. The District contains Hilo, the largest city on the island and the seat of County government, one of the island's two international airports, the primary port, and the University of Hawai‘i at Hilo. Macadamia nuts, flowers, and other diversified crops are grown in the South Hilo District.

— Puna District (21 percent)

The Puna District is located on the southeastern corner of the island and contains part of the East Rift Zone of Kilauea. The economy of this district recently endured the closure of the Puna Sugar Company. However, the Puna District is the fastest growing on the island, tripling in population between 1980 and 2000. This growth is fueled by subsistence and independent lifestyle communities, populated by residents drawn to a large supply of relatively inexpensive land and unimproved agricultural home-lots. The Puna district also supports diversified agriculture, including flowers, macadamia nuts, and other crops, as well as a portion of Hawai‘i Volcanoes National Park.

— Ka‘u District (4 percent)

The Ka‘u District covers most of the southern part of the island, including most of Hawai‘i Volcanoes National Park. Despite the closure of the Ka‘u Agribusiness sugar operation, the population of this district continues to increase for reasons similar to the Puna District mentioned above. The district also supports macadamia nuts and other diversified crops.

— South Kona District (6 percent)

The South Kona District is located on the southwestern coast of the island. It contains several small population centers, as well as Pu'uhonua O Honaunau National Historical Park. The district also supports macadamia nuts and other diversified crops.

— North Kona District (19 percent)

The North Kona District, located on the western coast of the island and extending upland to include the volcano Hualalai, contains the area of Kailua-Kona. The population of this District has more than doubled since 1980, supported by the growing tourism industry that provides the local population with access to jobs.

— South Kohala District (9 percent)

The South Kohala District, located on the northwestern corner of the island, contains the harbor of Kawaihae. Originally developed to serve the sugar industry, the port now services the growing population on the west side of the island. The district also contains Waimea, the third largest city on the island, as well as some of the major resorts on the Big Island.

— North Kohala District (4 percent)

The North Kohala District covers the northwestern tip of the island and hosts limited economic activity since the closure of a sugar plantation in the 1970s.

2.b. Primary Economic Activities

The principal economic activities in Hawai'i County are tourism, agriculture, and research.

2.b.(1) Tourism and Resort-Residential Development

The County hosted over 1.2 million visitors in the year 2000, resulting in an average of 21,831 visitors present on the island (the average visitor census). From 1990 to 2000, the average visitor census increased 28.6 percent, primarily due to an increase in the average length of stay. Total visitor arrivals declined between 1990 and 1995, but then increased between 1996 and 2000 to regain (approximately) 1990 levels.

Visitor expenditures totaled approximately $1.2 billion in 2000, an approximately 30.7 percent increase since 1990. This increase was slightly above the 27.7-percent increase in inflation as measured by the Consumer Price Index (CPI).

Hotels alone employ over 6,000 residents and have an annual payroll of over $163 million. Scenic and sightseeing transportation operators employ another 600 employees, with a payroll over $12.5 million.

Tourism on the Big Island is centered on the western coast of the island in North Kona and South Kohala, though the Hawai'i Volcanoes National Park on the southeastern quarter of the island is the single most popular tourist attraction. The climate of West Hawai'i, typically dry and sunny,

and the beauty and diversity of marine life off the coast have combined to support a growing tourism industry on this side of the island, while the ongoing volcanic activity at Kilauea, about 30 miles from Hilo, attracts visitors to the windward side of the island.

Considerable resort/residential development has and will continue to occur in West Hawai‘i, primarily in the North Kona and South Kohala Districts. Resort/residential development includes single-family and multi-family units that are associated with resort amenities such as golf courses, tennis courts, swimming facilities, spas, etc. Some units are placed in rental pools and used by visitors; some are time-share units; some are second homes owned by non-Hawai‘i residents; and some are homes of wealthy retirees from outside Hawai‘i. Occupants of resort/residential units tend to spend more money than the average Hawai‘i resident and have a lower demand on social services. Also, their income originates from outside Hawai‘i. Thus, their economic impact is very similar to that of a tourist.

The Big Island's visitor industry appears to have recovered from any short-term impacts from the terrorist attack of September 11, 2001. Contributing factors include the current volcanic activity at Hawai‘i Volcanoes National Park, the accessibility of active lava flows, and the increase in cruise-ship visitors to Hilo since 1998.

2.b.(2) Agriculture

Agriculture, while the second-largest industry on the Big Island, is much smaller than tourism. Specifically, in 2000, agricultural sales totaled approximately $154 million, or only 13 percent of visitor expenditures. During the 1990s, agricultural sales declined 22 percent, due primarily to the closure of sugar plantations.

In 1990, sugarcane was still the dominant crop on the island, covering 57,900 acres. The value of sugar sales (approximately $55 million) represented nearly half of the total value of crop sales on the Big Island in 1990. By 1995, however, only one sugarcane plantation remained and it harvested its last crop in 1996. The closure of the sugar plantations has increased the importance of diversified agriculture to the County's economy, with forestry as the most promising alternative. However, much former sugar land remains fallow.

The Big Island had 3,300 farms in the year 2000, employing approximately 4,500 people. This represents a 25 percent increase in the number of farms since 1990, but total farm and pasture acreage has dropped 13 percent since 1990 to 870,000 acres. These trends reflect the transition from larger sugar plantations to smaller farms focusing on diversified agriculture products.

Existing mature agricultural industries include macadamia nuts, papayas, coffee, and flowers and nursery products. However, the macadamia nut industry faces increased competition from areas such as Australia. In addition, the papaya ringspot virus has threatened the papaya industry, although papaya yields have rebounded due to the introduction of the virus resistant Rainbow papaya. Coffee sales remain strong, but Kona coffee remains primarily a gourmet crop. Flower and nursery products, including anthuriums and orchids, continue to expand, both in terms of acreage and sales. While these agricultural industries are mature, there is still growth potential for flowers and nursery products, coffee, and papaya.

Livestock operations also comprise a significant portion of the agriculture industry on the Big Island. Seventy percent of the state's inventory of cattle and calves is raised on ranches on the

Big Island; however, the overall number of animal units has dropped 21 percent since 1990 to 114,400. The value of cattle sales in 2000 was just over $14 million, down 39 percent since 1990.

Finally, aquaculture of algae, shellfish, and finfish is an emerging sector of the economy. Nearly half the State's aquaculture operations were based in Hawai'i County, and Hawai'i County is responsible for 72 percent of the total Statewide sales from aquaculture. In 2000, the value of aquaculture enterprises on the Big Island was estimated at nearly $16 million, up 219 percent from 1990.

2.b.(3) Scientific Research

Scientific and academic research is another significant component of the economy of Hawai'i County.[7]

Mauna Kea Observatory, at nearly 14,800 feet altitude, is the largest ground-based astronomical observing site in the world. Among the physical characteristics that set Mauna Kea apart from lesser sites are: its freedom from cloud cover, the darkness and dryness of its skies, the transparency of the atmosphere above it to infrared radiation, and the unusual stability of the atmosphere. Also, because the Hawaiian Islands are near the equator, astronomers can observe the entire northern sky and nearly 80 percent of the southern sky. The remoteness of Mauna Kea from major urban development and the strong County outdoor lighting ordinance preserve the darkness of its skies. In the late 1960s, the University of Hawai'i (UH) initiated a program to attract others to construct and operate telescopes on Mauna Kea in scientific collaboration with UH. First the Federal government, and then other countries joined Mauna Kea Observatory, including telescopes funded and operated by major U.S. mainland universities, Canada, France, the United Kingdom, Japan, Taiwan and others. In 1999, operating costs for the 13 major telescopes on Mauna Kea contributed approximately $48.5 million to the County of Hawai'i's economy and provided jobs for 351 County residents.

The Natural Energy Laboratory of Hawai'i supports a growing number of research projects. Located on 870 acres at Keahole Point, this development park provides the resources, facilities and support for energy and ocean-related research, educational and commercial activities in areas such as OTEC (ocean thermal energy conversion), aquaculture, cold seawater air conditioning, and infrasound monitoring. Today, the Natural Energy Laboratory hosts 26 projects, contributing over $30 million to the economy. In addition, the Pacific Aquaculture and Coastal Resource Center is a joint effort by the University of Hawai'i at Hilo (UH-Hilo), county, State and the Keaukaha Hawaiian Homelands Community Association to establish a research and training facility in Hilo for local aquaculture farmers and university students.

UH-Hilo is also a major contributor to the island's economy. In addition to new research and planned construction, including a $60 million China-U.S. center, a $30 million astronomy education center, and a $18 million agricultural research center, UH-Hilo attracts a large number of foreign students, who were expected to contribute $13.5 million to the local economy in 2002.

The Hawai'i Volcanoes National Park is another significant natural resource that supports a variety of different research projects, from the study of seismology and volcanology to botany and the ability of native ecosystems to recover after volcanic eruptions. The amount of funding for

[7] Consolidated data on the size of this industry are not available.

research varies from year to year, and the specific contribution that this research makes to the County's economy is not available.

2.c. Labor Force and Employment

In 2000, the County's civilian labor force numbered about 70,000 workers, up 13.7 percent since 1990. Employment reached 65,350 workers in 2000, up 10.4 percent since 1990 and the number of wage and salary jobs for Hawai'i County increased 14.3 percent between 1990 and 2000. The unemployment rate rose from four percent in 1990 to 6.7 percent in 2000.

The Big Island's top two employers are the State and county government, and 15 of the top 30 employers are in the tourism industry. By industry, the primary employers are: (1) services (hotel, tourism, and health); (2) trade (primarily retail); (3) government; and (4) transportation, communication, and utilities. The number of wage and salary jobs rose in all these categories from 1990 to 2000. On the other hand, wage and salary jobs declined in the following sectors: (1) construction and mining; (2) manufacturing; and (3) agriculture. Wage and salary jobs remained the same in the finance, insurance and real estate sector.

2.d. Personal Income

The County's total personal income and per-capita income was just over $2 billion and $16,603, respectively, in 1990, and by 2000 had risen to just over $3 billion and $20,399, respectively. This represents a significant increase in overall income of 50.8 percent, and a more modest increase in per-capita income of 22.9 percent. While beneficial, this modest increase in per-capita income failed to keep pace with inflation as measured by the 27.7-percent increase in the CPI during the same 1990-to-2000 period.

2.e. Outlook for Growth and Socioeconomic Change

The primary driving forces for the economy of the island of Hawai'i will continue to be tourism, resort/residential housing, and, to a lesser extent, research and high-technology activities, diversified agriculture, forestry, and inexpensive land for housing.

The Big Island's visitor industry is growing in a number of specific areas. In particular, resort residential developments catering to the luxury market will be the primary driver for growth in the North Kona and South Kohala areas. The long runway of the airport in Kona allows direct flights from overseas using wide-bodied aircraft, thereby making the Big Island a primary rather than a secondary tourist destination. In addition, the ongoing eruptions at Hawai'i Volcanoes National Park are a unique attraction and other eco-tourism activities are also expected to increase in the future. However, economic conditions in key tourist markets will influence the level of future growth in the visitor industry.

Most of the growth on the Big Island will continue to be on the western side of the island, particularly in districts of North Kona and South Kohala. Growth will be more limited in Hilo, but the Puna and Ka'u districts may experience growth in subsistence and independent lifestyle communities because of the availability of low cost land. Due to a variety of factors, including volcanic eruptions, difficult access, local community preferences regarding development, and others, little or no growth is anticipated in the following areas: (1) along the southeastern shoreline; (2) on the higher elevations of Mauna Kea and Mauna Loa; and (3) along the northeastern shoreline.

Table II-1. Socioeconomic Profile of the County of Hawai'i

Item	1990	2000	Growth since '90
Resident Population, County			
County of Hawai'i	120,317	148,677	23.6%
South Hilo District	44,639	47,386	6.2%
Puna District	20,781	31,335	50.8%
North Kona District	22,284	28,543	28.1%
South Kohala District	9,140	13,131	43.7%
South Kona District	7,658	8,589	12.2%
Hamakua District	5,545	6,108	10.2%
North Kohala District	4,291	6,038	40.7%
Ka'u District	4,438	5,827	31.3%
North Hilo District	1,541	1,720	11.6%
Visitors			
Annual Visitors, County	1,170,830	1,267,966	8.3%
By Origin			
U.S. Visitors	N/A	925,357	N/A
Foreign Visitors	N/A	342,609	N/A
Average Visitor Census, County	16,970	21,831	28.6%
Income from Major Industries			
($ million)			
Visitor Expenditures, County	$ 925.7	$ 1,210.0	30.7%
Agricultural Sales, County	$ 198.0	$ 154.5	-22.0%
Labor			
County of Hawai'i			
Civilian Labor Force	61,550	70,000	13.7%
Employed	59,200	65,350	10.4%
Unemployed	2,350	4,650	n/a
Unemployment Rate	3.8%	6.7%	n/a
County Jobs, Wage and Salary Only[1]	48,950	55,950	14.3%
Construction, mining	3,250	2,800	-13.8%
Manufacturing	2,250	1,650	-26.7%
Trans., communication, utilities	2,500	2,800	12.0%
Trade	12,600	13,600	7.9%
Finance, insurance, real estate	2,350	2,350	0.0%
Services and miscellaneous	14,250	19,100	34.0%
Government	8,450	10,950	29.6%
Agriculture	3,550	2,650	-25.4%
Personal Income, County			
Total ($ million)	$ 2,018	$ 3,044	50.8%
Per capita	$ 16,603	$ 20,399	22.9%
Consumer Price Index—All	138.10	176.30	27.7%

1. 2000 job counts are preliminary for specific industry.

Source: Department of Business, Economic Development & Tourism. *State Data Book.* Annual.
Hawai'i Agricultural Statistics Service. *Statistics of Hawaii Agriculture* . Annual.

Note: Entries may not sum to totals due to rounding.

THE ENDANGERED SPECIES ACT[8] **CHAPTER III**

This chapter provides relevant information from the 1973 Endangered Species Act (the Act), including the role of critical habitat designation in protecting threatened and endangered species, requirements for consulting with the Service to insure that certain Federal actions do not endanger listed species or their habitats, and prohibited activities that apply to listed species.

1. ROLE OF SPECIES LISTING AND CRITICAL HABITAT DESIGNATION IN PROTECTING THREATENED AND ENDANGERED SPECIES

For species listed as threatened and endangered, the Act requires the Service to designate critical habitat to the maximum extent prudent and determinable. The Act defines critical habitat as the specific areas containing features essential to the conservation of a threatened or endangered species and that may require special management considerations or protection.

For listed species, section 7(a)(2) of the Act requires Federal agencies to consult with the Service in order to ensure that activities they fund, authorize, permit, or carry out are not likely to *jeopardize* the continued existence of the species. The implementing regulations define *jeopardy* as any action that would appreciably reduce the likelihood of both the survival and recovery of the species.

For the critical habitat of listed species, section 7(a)(2) further requires Federal agencies to consult with the Service to ensure that activities they fund, authorize, permit, or carry out do not result in destruction or *adverse modification* of critical habitat. *Adverse modification* of critical habitat is defined as any direct or indirect alteration that appreciably diminishes the value of critical habitat for the survival and recovery of the species.

As stated in the proposed rule, "... critical habitat also provides non-regulatory benefits to the species by informing the public and private sectors of areas that are important for species recovery and where conservation actions would be most effective." "Critical habitat also identifies areas that may require special management considerations … and may help provide protection to areas where significant threats to the species have been identified or help to avoid accidental damage to such areas."

[8] **Note to Reader:** Readers who are already familiar with the Act may wish to skip this chapter and proceed to the next background-information chapters (Chapters IV and V), or to the economic analysis (Chapter VI).

2. CONSULTATION UNDER SECTION 7 OF THE ACT

In accordance with section 7 of the Act, the implementing regulations require Federal agencies to consult with the Service whenever activities they fund, authorize, or carry out may affect listed species or designated critical habitat. Section 7 consultation with the Service is designed to ensure that current or future Federal actions do not appreciably diminish the value of critical habitat for the survival and recovery of a listed species.

The Service has authority under section 7 to consult on activities on land owned by individuals, organizations, states, or local and tribal governments only if the activities on the land have a *Federal nexus*. A *Federal nexus* occurs when the activities require a Federal permit, license, or other authorization, or involve Federal funding. The Service does not have jurisdiction under section 7 to consult on activities occurring on non-Federal lands when the activities are not federally funded, authorized, or carried out. In addition, consultation is not required for activities that do not affect listed species or their critical habitat.

When consultations concern activities on Federal lands, the relevant Federal Action agency initiates consultation with the Service. When an activity proposed by a state or local government or private entity requires a Federal permit or is federally funded or carried out, the Federal agency with the *nexus* to the activity initiates consultation with the Service. For example, the Army Corps of Engineers is the agency that issues section 404 permits under the Clean Water Act, so it is the Action agency that initiates consultation when an activity that requires a permit may affect a listed species or designated critical habitat.

The consultation begins after the Federal Action agency determines that its action may affect one or more listed species or their designated critical habitat, even if the effects are expected to be beneficial since projects with overall beneficial effects could include some adverse impacts. Consultations are frequently conducted for multiple species if more than one species is affected by the action.

The consultation between the Federal Action agency and the Service may involve informal consultation, formal consultation in the case of adverse impacts, or both. Informal consultation may be initiated via a telephone call or letter from the Action agency, or a meeting between the Action agency and the Service. In preparing for an informal consultation, the Action agency compiles all the biological, technical, and legal information necessary to analyze the scope of the activity and discusses strategies to eliminate adverse effects on listed species or critical habitat. Through informal discussions, the Service assists the Action agency and the Applicant, if any, in identifying and resolving potential conflicts at an early stage in the planning process, and may make recommendations, if appropriate, on ways to avoid adverse effects.

If during informal consultation the Federal Action agency determines that its action (as originally proposed or revised and taking into account direct and indirect effects) "is not likely to adversely affect" listed species or critical habitat (e.g., the effects are beneficial, insignificant or discountable), and the Service agrees with that determination, then the Service provides concurrence in writing and no further consultation is required.

But if the proposed action, as revised during informal consultation, is still likely to adversely affect listed species or critical habitat, the Action agency must request in writing initiation of formal consultation with the Service and submit a complete initiation package. Formal consultations, which are subject to specific timeframes, are conducted to determine whether a proposed action is likely

to *jeopardize* the continued existence of a listed species or destroy or *adversely modify* designated critical habitat. This determination depends on the extent to which a project may affect the species. Many variables, including the project's size, location and duration, may influence the extent of the impact and, in turn, the determination of a "may affect" opinion.

If the Service finds, in its biological opinion, that a proposed action is not likely to *jeopardize* the continued existence of a listed species, or destroy or *adversely modify* the critical habitat—even though the action may adversely affect listed species or critical habitat—then the action likely can be carried out without violating section 7(a)(2) of the Act.

On the other hand, if the Service finds that a proposed action is likely to *jeopardize* the continued existence of a listed species and/or destroy or *adversely modify* the critical habitat, then the Service provides the Action agency with reasonable and prudent alternatives that will keep the action below the thresholds of *jeopardy* and/or *adverse modification*, if any can be identified.

The Service works with Action agencies and Applicants in developing reasonable and prudent alternatives. A reasonable and prudent alternative is one that (1) can be implemented in a manner consistent with the intended purpose of the action; (2) can be implemented consistent with the scope of the Action agency's legal authority and jurisdiction; and (3) is economically and technologically feasible. The Service will, in most cases, defer to the Action agency's expertise and judgment as to the feasibility of an alternative. Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of a project. Costs associated with implementing reasonable and prudent alternatives vary accordingly.

3. TAKING AND OTHER RESTRICTIONS OF THE ACT

3.a. Wildlife Species

Regardless of any *Federal involvement* and/or critical habitat designation, once a species has been formally listed as threatened or endangered, it is entitled to certain regulatory protections under the Act. First and foremost, section 9 of the Act specifically prohibits the *taking* of any endangered species of fish or wildlife (the prohibition does not extend to plants). The term *take* is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." The regulations at 50 CFR section 17.3 define "harm" to mean an act that actually kills or injures wildlife. This may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering. In addition, endangered species, their parts or any products made from them may not be imported, exported, possessed or sold. Section 4(d) of the Act gives the Service regulatory discretion to extend the protections of section 9 to threatened species. While clearly prohibiting direct injury to individuals of a listed species, the restrictions on *takings* also apply to actions that destroy or alter the habitat of a listed species if the habitat alteration would result in harm to the species.

However, the Act allows the Service to permit *take* by private applicants that would otherwise be prohibited, provided such *taking* is "incidental to, and not [for] the purpose of, the carrying out of an otherwise lawful activity." Section 10(a)(1)(B) of the Act allows non-Federal parties planning activities that have no *Federal nexus*, but which could result in the incidental *taking* of listed animals, to apply for an incidental *take* permit. The application must include a habitat conservation plan laying out the proposed actions, determining the effects of those actions on affected fish and wildlife species and their habitats (often including proposed or candidate species),

and defining measures to minimize and mitigate adverse effects. The Service may elect to issue an incidental *take* permit if the incidental *take* is to be minimized by reasonable and prudent measures and implementing terms and conditions that are stipulated in the permit.

3.b. Plant Species

Section 9(a)(2) of the Act states that it is unlawful to remove and possess any endangered plant species from areas under Federal jurisdiction; maliciously damage or destroy any such species on any such area; or remove, cut, dig up, damage, or destroy any such species on any other area in knowing violation of any state law. In addition, endangered species, their parts or any products made from them may not be delivered, received, transported, shipped or sold in interstate or foreign commerce. As above, section 4(d) of the Act gives the Service regulatory discretion to extend the protections of section 9(a)(2) to threatened plant species.

However, the Service may give permission to remove a listed plant from areas under Federal jurisdiction, and may also give permission for actions that are otherwise prohibited by section 9 of the Act for "scientific purposes or to enhance the propagation or survival of the affected species including, but not limited to, acts necessary for the establishment and maintenance of experimental populations."

EXISTING PROTECTIONS IN HAWAI'I COUNTY[9] CHAPTER IV

In addition to the Act, other existing regulations and land-management programs protect Hawai'i's threatened and endangered species and their habitats. This chapter provides an overview of these protections, including: other Federal programs, State protections for listed species, State land-use controls affecting public and private lands, county land-use controls, and land management by various public and private organizations. Those protections in place on proposed critical habitat are summarized in Table I-1. As appropriate, the information in this chapter and in Table I-1 is used in Chapter VI to estimate the section 7 economic impacts that occur over and above impacts attributable to existing protections.

1. FEDERAL SPECIES PROTECTIONS AND LAND MANAGEMENT

1.a. Integrated Natural Resources Management Plans

The Sikes Act Improvements Act (SAIA) of 1997 requires every military installation containing land and water suitable for the conservation and management of natural resources to complete, by November 17, 2001, an Integrated Natural Resources Management Plan (INRMP). The purpose of the INRMP is to integrate the mission of the military installation with stewardship of the natural resources found there. Each military installation that has listed species or critical habitat on areas it manages consults with the Service on its INRMP.

The Pohakuloa Training Area (PTA) is on State-owned land that is leased and administered by the United States Army Garrison, Hawai'i (Army) for live-fire training. 10 plant species are known to inhabit the PTA. The Army has written an INRMP, an Ecosystem Management Plan, an Endangered Species Management Plan, a Fire Management Plan, and annual reports on the natural resources management projects performed under the Ecosystems Management Program at PTA. The Army is also currently engaged in discussions with the Service to identify training-related impacts to the 10 listed species at PTA and develop measures that avoid, minimize and offset those impacts.

[9] **Note to Reader:** Readers already familiar with existing protections in Hawai'i of threatened and endangered species and their habitats may wish to skip this chapter and proceed to the approach to the analysis (Chapter V), or to the economic analysis (Chapter VI).

1.b. Conservation Partnerships Program, Pacific Islands Ecoregion

The Service's Conservation Partnerships Program is a collection of voluntary habitat restoration programs having the goal of restoring native Pacific Island ecosystems through collaborative projects with private landowners, community groups, conservation organizations, and other government agencies. The Program can provide cost-share funds, as well as information on habitat restoration techniques, native species, Safe Harbor Agreements, additional funding sources, required permits, and potential vendors of restoration services (fence contractors, nurseries, etc.) The Program is divided into five sections, discussed below.

1.b.(1) Partners for Fish and Wildlife Program

The Partners for Fish and Wildlife (PFW) Program is the Service's habitat restoration program for long-term conservation on private land. The PFW Program was established to offer technical and financial assistance to landowners who wish to restore wildlife habitat on their property. PFW Programs can include constructing fences to exclude feral ungulates; controlling the population of feral ungulates, weeds, rodents, and alien insects; restoring native ecosystem elements such as hydrology and micro-habitat conditions; and reintroducing native species.

The Service provides assistance ranging from informal advice on the location and design of potential restoration projects to cost-shared funding under a formal cooperative agreement with the landowner. If warranted, the Service also provides participating landowners with technical assistance to develop Safe Harbor Agreements that cover habitat managed for endangered or threatened species. The Agreements provide assurances to landowners that additional land, water, and/or restrictions on uses of natural resources will not be imposed as a result of their voluntary conservation actions.

Since funding is limited, the projects given the highest priority are those that manage or reestablish natural biological communities and provide long-term benefits to declining migratory bird and fish species and species that are endangered, threatened, or proposed for listing; and projects on private lands that provide expanded habitat for wildlife populations that inhabit National Wildlife Refuges.

Currently, there are two ongoing projects on the Big Island in forest and wetland restoration. The wetland restoration project involves the restoration of unique anchialine ponds which help to protect the rare Hawaiian shrimp as well as provide habitat for listed wetland bird species.[10] The Forest Restoration project involves a fencing project on Kamehameha School's land that protects both the native *palila* bird habitat and the native forest from feral ungulates.

1.b.(2) The Hawai‘i Biodiversity Joint Venture

The Hawai‘i Biodiversity Joint Venture (HBJV) is a public-private effort to protect, maintain, improve, and restore the native biological diversity of the Hawaiian Islands. In this program, the Service's mission is to work with others to conserve, protect, and enhance fish, wildlife, and plant populations and their habitats.

---

[10] Anchialine denotes coastal marine or brackish water bodies that lack surface connection to the sea but reflect subsurface hydrologic connections to the sea.

The HBJV was initiated with the following goals:

— Maintain natural communities and habitats for native species;

— Support efforts to cooperatively manage significant native ecosystems on public and private land;

— Develop natural resource management techniques to address widespread threats (such as feral ungulates, weeds, rats, and alien insects) to Hawai‘i’s native ecosystems;

— Restore former wetlands, native forests and other natural communities on public and private lands; and

— Protect native Hawaiian ecosystems and natural communities through land and water acquisition and management.

Since funding is limited, the Service gives priority to projects that implement management or research actions that directly contribute to protecting or restoring habitats for multiple endangered, threatened, candidate, or rare species; address key threats to native ecosystems or habitats; and benefit rare or unique ecosystems or habitats.

1.b.(3) Pacific Islands Coastal Program

The Pacific Islands Coastal Program identifies and conserves important coastal natural resources. The goals of the program are to:

— Identify and prioritize coastal natural resources and threats;

— Implement on-the-ground projects in partnership with others; and

— Promote public stewardship of coastal fish, wildlife, plants and their habitats.

The objectives of the program include:

— Protecting and restoring coastal wetlands and uplands, anchialine pools, estuaries, coral reefs and streams;

— Preventing and eradicating invasive alien species in coastal areas;

— Protecting and restoring watersheds for native species’ habitat needs;

— Building public support through partnerships, education and community involvement; and

— Inventorying and mapping coastal resources.

1.b.(4) Endangered Species Landowner Incentive Program

The Endangered Species Landowner Incentive Program is a focused effort to combine cost-share funds and regulatory relief incentives (Safe Harbor Agreements and Candidate Conservation Agreements) to address high-priority habitat restoration needs of endangered, threatened and candidate species.

1.b.(5) Other Habitat Restoration Programs

Other Habitat Restoration Programs include the National Coastal Wetlands Conservation Grant Program and the North American Wetlands Conservation Grant Program. In addition, the Conservation Partnerships Program seeks to provide a connection between habitat restoration projects and non-Service funding sources.

1.c. Wildlife Habitat Incentives Program

Under the Wildlife Habitat Incentives Program (WHIP), the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) provides assistance to landowners and lessees (leases must be five years or more) to protect and restore Hawai‘i’s native habitats as well as habitats of threatened and endangered species. In Hawai‘i, the focus is on the following habitats:

- Threatened/endangered plant species habitat;
- Native forests/riparian areas adjacent or connected to a native forest reserve, wildlife refuge, or other preserved forest/riparian area;
- Montane wetlands and bogs;
- Coastal dunes that support rare plants, seabirds, monk seals or turtles;
- Anchialine pools;
- Endangered waterbird and migratory bird habitat; and
- Caves and rare species habitat.

The NRCS works with private landowners and lessees to help them develop a Wildlife Habitat Development Plan for their land that benefits native wildlife and meets other goals and objectives of WHIP. If the Plan is selected for funding, a five- to 10-year contract is entered into whereby the landowner or lessee agrees to undertake wildlife habitat development practices such as noxious weed control, fencing, planting of native trees, and wetland restoration. In turn, NRCS reimburses the landowner or lessee 75 percent of the cost of carrying out these practices at specified rates. However, the funds cannot be used for mitigation of any kind, or on any land designated as converted wetland.

1.d. Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP) is a voluntary USDA conservation program for farmers and ranchers who wish to address serious threats to soil, water, and related

natural resources on their property. Administered through NRCS, EQIP provides technical, financial and education assistance for designated priority areas or significant statewide resource concerns.

Eligible land includes cropland, rangeland, pasture, forestland, and other farm or ranch lands. To evaluate proposed EQIP projects, NRCS first assesses the environmental benefits to be achieved from the planned implementation of conservation practices. Subsequently, applications are then ranked based on the amount of financial assistance requested and the projected environmental benefits.

EQIP offers five- to 10-year contracts for the implementation of conservation practices in each site-specific conservation plan. Each conservation plan, developed with assistance from NRCS or other service provider, must treat the targeted resource concern to a sustainable level. NRCS may pay up to 75 percent of the costs for eligible conservation practices which improve or maintain the health of the natural resources in the area.

Four areas have been designated EQIP Priority Areas on the Big Island: Hamakua-Hilo; Ka‘u; Wood Valley; and Puna. The Hamakua-Hilo Priority Area has two focus areas: one in Hamakua and one in the Lower Hamakua Ditch section. Both areas target resource concerns such as sedimentation, erosion, animal waste, noxious weeds, and insufficient water supply. The Ka‘u Priority Area targets sedimentation, erosion, animal waste, noxious weeds, and insufficient water supply. The Wood Valley Priority Area project targets flooding, excess surface water, and insufficient water supply. The Puna Priority Area targets animal waste, noxious weeds, and loss of plant diversity.

1.e. Conservation Reserve Program

The Conservation Reserve Program (CRP) is a voluntary program administered through the Farm Service Agency, with technical assistance provided by the NRCS. By offering annual rental and cost-share assistance, NRCS encourages farmers and ranchers to plant long-term vegetative cover to improve soil, water, and wildlife resources.

To be eligible for CRP, land must have been planted in an agricultural commodity two out of the last five years. Some marginal pastureland may also quality for CRP if suitable for planting. In addition, the land must be considered highly erodible or subject to scour erosion. Finally, the land must be devoted to any of a number of highly beneficial environmental practices, such as filter strips, riparian buffers, grass waterways, shelter belts, wellhead protection areas, and other similar practices.

Annual rental payments are made based on the agricultural rental value of the land. Cost-share assistance will cover up to 50 percent of the cost of establishing the grass or trees on the land. CRP contracts last from 10 to 15 years, depending on the goals of the operator.

1.f. National Parks

The National Park System, operated by the National Parks Service, was established to preserve natural areas in the United States so that they can be enjoyed by current generations and preserved for future generations.

Hawai‘i Volcanoes National Park, the only national park on the Big Island, was established in 1916 and encompasses 230,000 acres that range from sea level to the summit of Mauna Loa at

13,677 feet. Kilauea, the world's most active volcano, offers scientists insights on the birth of the Hawaiian Islands and visitors views of volcanic landscapes. Over half of the park is designated wilderness and provides hiking and camping opportunities. The park concentrates its conservation activities in the most biologically diverse habitats and those that offer the best chance for successful restoration. The immediate strategy is to control or eliminate the most disruptive alien plants and animal pests. Park crews erect fences to keep out feral animals; track and kill feral pigs; and pull out or cut down non-native trees.

1.g. National Wildlife Refuges

Over 500 National Wildlife Refuges across the United States form a system of habitats managed by the Service. Hawai'i's Refuges were established to protect the Islands' unique native plants and animals and their habitats.

On the Big Island, the Hakalau Forest National Wildlife Refuge consists of the 33,000-acre Hakalau Forest Unit and the 5,300-acre Kona Forest Unit.

— Hakalau Forest Unit: this area is located between the 2,500 and 6,600 foot elevations on the windward slope of Mauna Kea approximately 12 miles northwest of Hilo. It was established in 1985 to conserve endangered forest birds and their rain forest habitat. Eight endangered bird species, an endangered bat and nine endangered plant species exist in this district.

— Kona Forest Unit: This area is located on the leeward (western) slope of Mauna Loa between the elevations of 2,000 and 6,000 feet and is somewhat drier than the Hakalau Unit. The unit is not open to the public. The Kona Forest Unit is somewhat drier than the Hakalau Unit. It also protects some of the last remaining endangered *'alala* (Hawaiian crow) living in the wild. This area supports substantial populations of the same native and endangered birds that occur within the Hakalau Unit, the endangered Hawaiian hoary bat and a high diversity of common and rare mesic forest plants and invertebrates.

2. STATE LAND MANAGEMENT

2.a. State Districting

All lands in Hawai'i are allocated by the State into one of four districts: Conservation, Agricultural, Urban or Rural. The State, through its Department of Land and Natural Resources (DLNR) and its Board of Land and Natural Resources (the Board), has primary land-management responsibility for activities and development in the Conservation District, while the counties have primary responsibility in the Urban, Rural and Agricultural Districts.

2.b. The Conservation District

The purpose of the Conservation District is to conserve, protect and preserve the State's important natural resources through appropriate management in order to promote the long-term sustainability of these natural resources, and to promote public health, safety and welfare (Hawai'i Revised Statutes, Chapter 183C). To this end, only limited development and commercial activity are allowed in the Conservation District. "Important natural resources" include the watersheds that supply potable water and water for agriculture; natural ecosystems and sanctuaries of native flora

and fauna, particularly those which are endangered; forest areas; scenic areas; significant historical, cultural, archaeological, geological, mineral and volcanological features and sites; and other designated unique areas.

Permission is required to use land, construct facilities, or conduct other activities in the Conservation District (see below). Permits for routine uses or activities are issued by DLNR, while more complex activities or uses (such as certain construction projects and commercial operations) require formal approval of a Conservation District Use Application (CDUA) by the Board, and often require an approved management plan.

2.c. Conservation District Subzones

All land in the Conservation District has been assigned to one of five subzones that reflect a hierarchy of uses from the most restrictive to the most permissive. These subzones are the Protective Subzone (the most restrictive), Limited, Resource, General and Special (Hawai'i Administrative Rules, Title 13, Chapter 5). Except for the Special Subzone, all uses and activities allowed in a more restrictive subzone in the hierarchy are allowed in the less restrictive subzones.

2.c.(1) Protective Subzone

The Protective Subzone, the most restrictive of the five subzones, was established to "protect valuable resources in designated areas such as restricted watersheds, plant and wildlife sanctuaries, and other designated natural and unique areas." Correspondingly, lands and waters generally included in this subzone are needed to protect watersheds, water sources, and water supplies; and to preserve the natural ecosystems of native plants and wildlife, particularly endangered species.

No structures, homes, or farm activities are allowed in the Protective Subzone, with two exceptions. First, the land can be used by State and county governments and by non-government entities that serve the public (e.g., the local utility companies) "for public purpose"—i.e., to fulfill mandated government functions for the public benefit such as transportation systems, water systems, and communications systems or recreational facilities. Second, Native Hawaiians owning *kuleana* land (land that was granted to Native-Hawaiian tenants in the mid-1800s) may use it for agriculture or single-family residences if their land was used "historically and customarily" for these purposes.

Allowed uses (by permit or Board approval) in the Protective Subzone include: replacing or reconstructing an existing structure and some types of accessory structures, habitat improvements for plant and wildlife sanctuaries, Natural Area Reserves, wilderness areas and scenic areas, limited removal of certain trees, and removal of noxious plants from small areas provided that the ground is not disturbed significantly. Limited landscaping is allowed, but is restricted to plants that are endemic or indigenous; alien subspecies are specifically prohibited.

2.c.(2) Limited Subzone

The Limited Subzone encompasses areas that are potentially dangerous to the public due to possible flooding, soil erosion, *tsunami* (tidal waves), volcanic activity or landslides. Lands having a general slope of 40 percent or more are also included in this subzone. The purpose of the Limited Subzone is to limit uses where natural conditions suggest that human activity should be constrained.

In addition to what is permitted in the Protective Subzone, the following activities and uses are allowed in the Limited Subzone by permit or Board approval: accessory structures near existing structures; single-family homes (one per lot) if State and county regulations are followed; agricultural activities; facilities or devices used to control erosion, floods and other hazards; botanical gardens and private parks; landscaping; and removal of noxious plants in areas larger than 10,000 square feet that result in significant ground disturbance.

2.c.(3) Resource Subzone

The Resource Subzone encompasses lands that are suitable for growing and harvesting commercial timber or other forest products, park land, and land for outdoor recreation (hunting, fishing, hiking, camping and picnicking, etc.). The purpose of the Resource Subzone is to develop properly managed areas to ensure the sustainable use of Hawai‘i’s natural resources.

In addition to what is permitted in the Protective and Limited Subzones, the following activities and uses are allowed in the Resource Subzone by permit or Board approval: commercial forestry under an approved management plan, and mining and extraction of any material or natural resource.

2.c.(4) General Subzone

The General Subzone is used to designate open space where special conservation uses may not yet be defined, but where urban uses may be premature. This subzone encompasses lands that may not be adaptable to or needed currently for urban, rural or agricultural use. The General Subzone also includes lands that are suitable for farming, flower gardening, nursery operations, orchards and grazing. Golf courses are not allowed.

In addition to what is permitted in the Protective, Limited and Resource Subzones, facilities necessary for the above-mentioned uses are allowed by permit when these facilities are compatible with the natural physical environment, and the use promotes natural open space and scenic value.

2.c.(5) Special Subzone

Special Subzones are designated for educational, recreational and research purposes. These subzones set aside lands possessing unique developmental qualities that complement the natural resources of an area.

2.d. Additional Management in the Conservation District

In addition to the five subzones in the Conservation District, the State has established further controls by defining other areas it manages within the Conservation District. These include Forest Reserves, the Natural Area Reserve system, State Hunting Units, State parks and State trails. These are discussed below.

2.d.(1) Forest Reserves

State Forest Reserves were first established in Hawai‘i over a century ago to protect the supply of high-quality water that was being threatened due to the destruction of Hawai‘i’s rainforests. The stated purpose of a Forest Reserve is to protect native ecosystems and important watersheds (Hawai‘i Revised Statutes, Sections 183-2 and 183-17). Most of Hawai‘i’s Forest

Reserves are in the Resource Subzone. Limited collecting for personal use (e.g., *ti* leaves and bamboo) is allowed by permit, as is limited (no more than $3,000 value per year) commercial harvesting of timber, seedlings, greenery and tree ferns. Commercial forestry operations are allowed only with approval from the Board. Permission is required to reside in a Forest Reserve, hunt (see below), camp and fish. Land vehicles, mountain bikes, horses, mules and leashed dogs are allowed on designated roads and trails.

Collecting endangered or threatened plants or wildlife is not allowed and, except in the situations described above or with Board approval, no forms of plant or animal life may be removed, injured or killed.

On the Big Island, State Forest Reserves are found in Hilo, Honuaʻula, Kapapala, Kaʻu, Kohala, Malama-Ki, Manowaialeʻe, Mauna Kea, Mauna Loa, Olaʻa, Puʻu Waʻawaʻa, South Kona, and Upper Waiakea.

2.d.(2) Natural Area Reserves

A Natural Area Reserve (NAR) is based on the concept of protecting ecosystems rather than individual species, with the goal of preserving and protecting representative samples of Hawaiian biological ecosystems and geological formations (Hawaiʻi Revised Statutes, Sect. 195-5). Although most NARs are located in the State Conservation District, they can include land in other Districts.

Management activities in a NAR include restoring and enhancing existing populations of native plants, removing non-native weeds, and working with local hunters to keep non-native animal populations low in sensitive areas.

Permitted activities in NARs include hiking, nature study and bedroll camping. Game hunting and research or educational activities are allowed by permit. Prohibited activities in NARs include: improvements or construction; tent camping; vehicles, except on designated roads; and removing, injuring, killing or introducing plants or wildlife.

The Big Island contains the following NARs:

— Kahauale'a: This 16,726 acre reserve includes wet *'ohi'a* (*Metrosideros polymorpha*) forests. The reserve is located on the gentle slopes of Kilauea; a site of much recent volcanic activity. Montane and lowland wet forests, a lowland mesic forest, and successional communities are represented.

— Kipahoehoe: This 5,583 acre reserve includes rare lowland grassland, dry and mesic forests, montane wet forests and lowland lava tube systems. The reserve is located on the narrow section of land running down the southwest slopes of Mauna Loa. It protects a rare lowland dry grassland, as well as lowland dry and mesic forests, montane wet forests, montane, and lowland lava tube ecosystems. Unlike the barren new lava in portions of Kahauale'a, the 1950 flow is well along the way to being reclaimed by surrounding *'ohi'a* forests.

— Laupahoehoe: Found on the northern slopes of Mauna Kea in the cloud belt, this 7,894 acre reserve is characterized by gentle to moderate slopes with young intermittent streams. The reserve contains lowland and montane wet

ʻohiʻa forests, small lakes, rare plants, and forest bird habitat. Koa and *ʻohiʻa* trees form the dominant upper canopy. Tree ferns (*Cibotium spp*., or *hapuʻu*) may grow over 20 feet in height, forming an important sub-canopy layer upon which many rare plants and invertebrates depend for food and shelter.

— Manuka: This reserve lies on the southern tip of the island. It is the largest reserve at 25,550 acres. This reserve forms an ahupuaʻa (land division) running from 5,000 feet in elevation *mauka* (mountain) to *makai* (sea). Its dry to mesic forests are dominated by large *koa* (*Acacia koa*) and *ʻohiʻa* trees. Extending from sea level to 5,000 feet in elevation, Manuka NAR features a broad range of habitats. These include subalpine shrublands and forests, mesic montane forests, wet montane forests, lowland mesic and dry forests, and lava anchialine pools.

— Mauna Kea Ice Age: Located in the upper, southern flank of Mauna Kea, this reserve contains a rare alpine aeolian desert and the only alpine lake in Hawaiʻi. Rare native invertebrates and evidence of Pleistocene glaciation can be found. Mauna Kea Ice Age also contains important cultural resources as it was once a Hawaiian adze quarry site.

— Puʻu Makaʻala: This reserve contains 12,106 acres of montane wet *ʻohiʻa* and koa forests. Located on the gentle sloping eastern flank of Mauna Loa, Puʻu Makaʻala protects montane wet *ʻohiʻa* and *koa* forests. A montane wet grassland ecosystem is also represented. This reserve is home to many rare plants and animals.

— Puʻu O Umi: This 10,142 acre reserve includes rare montane bogs, montane wet cliff ecosystems, intermittent and perennial streams, lowland dry forests and shrublands, and coastal dry shrublands. This reserve covers the west upper slopes and summits of the Kohala Mountains down to the dry coastal sea cliffs. Two rare montane bogs are found at Puʻu O ʻUmi, along with montane wet grasslands, shrublands, and forests. These areas are habitats for several rare plants and animals such as the endangered *koloa* (Hawaiian duck). The reserve is also an important watershed.

— Waiakea: The Waiakea 1942 Lava Flow, located on the sloping northeast flank of Mauna Loa, provides an example of successional communities on a recent lava flow in a wetter area than Kipahoehoe. This reserve illustrates a recent lava flow being colonized by *ʻohiʻa*. Other successional communities in a montane wet *ʻohiʻa* forest ecosystem are also represented.

2.d.(3) Wildlife Sanctuaries

Wildlife sanctuaries are established by the State to conserve, manage and protect indigenous wildlife (Hawaiʻi Revised Statutes, Sections 13-125). Within these sanctuaries, the following activities are prohibited: (1) to remove, disturb, kill, or possess any form of plant or wildlife; and (2) to introduce any form of plant or animal life. Also, human activity is strictly limited: no firearms or hunting equipment are allowed in nearly all sanctuaries; no camping, no fires, and no

vehicles are allowed except on designated roads; and, in many cases, no entry is allowed except by permit for scientific, educational, or conservation purposes.

Several wildlife sanctuaries exist on the Big Island. These sanctuaries include Kipuka Ainahou, a nene sanctuary and Pu‘u Wa‘awa‘a Wildlife Sanctuary.

2.d.(4) Hunting Units

A total of 47 hunting units, administered by DLNR, have been established across the State to control game hunting (Hawai‘i Administrative Rules, Title 13, Chapters 122 and 123). The Big Island has 11 such hunting units totaling 695,000 acres for hunting feral pigs, sheep and goats, pheasant (three species), Francolin (three species), chukar partridge, quail (three species), grouse, dove (three species), and wild turkey.

Within the State Hunting Units, hunting is a licensed activity and is restricted. Restrictions vary among the islands and address: bag limits, hunting seasons, days allowed, hours of the day, and hunting method (rifle, muzzleloader, shotgun, handgun, bow and arrows, spear, dogs and knives). DLNR’s intent is to manage the hunting areas, game-mammal populations, and the level of hunting activity to achieve a reasonable balance between (1) recreational benefits for hunters and (2) protection to native ecosystems and threatened and endangered plants. Game hunting restrictions on private land are set by the landowner.

2.d.(5) State Parks

The State Parks System was established to govern the use and protection of all lands and historical and natural resources in Hawai‘i’s State parks (Hawai‘i Revised Statutes, Sections 184-3 and 184-5). Within State parks, approvals are required from the Board to erect communications equipment (such as aerials, antennas and transmitters), vacation cabins, and concession facilities. Activities requiring permits from DLNR include limited camping, lodging (e.g., private and State cabins), fresh-water fishing, and hiking on certain trails. Uses allowed without a permit include limited collecting of renewable products (fruits, berries, flowers, seeds, and pine cones) for personal use; hiking on most trails; picnicking; and mountain biking (unless posted signs indicate otherwise).

The following State parks are located on the Big Island:

— ‘Akaka Falls State Park: This 65.4 acre park is located 3.6 miles southwest of Honomu. The park includes a 0.4-mile loop footpath through lush tropical vegetation and to scenic vista points overlooking the cascading Kahuna Falls and the free-falling ‘Akaka Falls which plunges 442 feet into a stream-eroded gorge.

— Hapuna Beach State Recreation Area: This 61.8 acre park is located 2.3 miles south of Kawaihae. The park includes a landscaped beach park with beach-related activities, picnicking and shelter lodging opportunities.

— Kohala Historical Sites State Monument: This 6.7 acre park is located near the northern tip of the island. The park provides viewing of Mo‘okini Heiau and the Kamehameha I Birthsite. The *heiau*, a National Historic Landmark, is one of the most famous sacrificial temples on the island.

— Kalopa State Recreation Area: This 100 acre park is located at 2,000 feet elevation five miles southeast of Honokaʻa. Park amenities include lodging, picnicking, easy family nature hike (0.7-mile loop trail) in a native *ohi'a* forest, and the beginnings of an arboretum of the Island's native plants.

— Kealakekua Bay State Historical Park: This four acre park is located in Napoʻopoʻo. The Park provides viewing of Hikiau Heiau--the place of worship where priests offered reverence to Captain Cook in 1779, believing that he was the god Lono returning to them as promised.

— Kona Coast (Kekaha Kai) State Park: This newer park is located 2.6 miles north of Keahole Airport. Separate, unpaved 1.5 mile access roads from the highway lead to Mahaiʻula and Kua Bay sections of the park. The Mahaiʻula section has a sandy beach and dune offering opportunities for swimming and beach-related activities. The Kua Bay section at the north end of park offers beach-related activities. The park also features several hiking trails.

— Lapakahi State Historical Park: This 262.0 acre park is located 12.4 miles north of Kawaihae. Park activities include re-enactment of the early Hawaiian life of the common people through cultural demonstrations of daily activities, story telling, and a self-guided walk through the partially restored remains of this ancient Hawaiian coastal settlement.

— Lava Tree State Monument: This 17.1 acre park is located 2.7 miles southeast of Pahoa. The park provides viewing of an excellent example of a forest of lava trees. This unusual volcanic feature is the result of a lava flow that swept through this forested area and left behind lava molds of the tree trunks.

— MacKenzie State Recreation Area: This 13.1 acre park is located nine miles northeast of Kaimu. The low-cliffed volcanic coastline has shore fishing, picnicking, and tent camping in a ironwood grove. An old Hawaiian coastal trail traverses the park.

— Manuka State Wayside: This 13.4 acre park is located 19.3 miles west of Naʻalehu. It provides place for the touring public to stop and rest and to picnic among a collection of native and introduced trees.

— Mauna Kea State Recreation Area: This 20.5 acre park is located at 6500 feet elevation on Saddle Road, 35.1 miles west of downtown Hilo. The park provides shrub land picnicking and lodging opportunities.

— Old Kona Airport State Recreation Area: This 103.7 acre park is located at the end of Highway 11 in Kailua-Kona. This state park is a beach park that provides a wide range of beach-related activities.

— Wailoa River State Recreation Area: This 131.9 acre park is located on the banks of Wailoa River in downtown Hilo. Opportunities for pleasure walking, quiet relaxation, picnicking, and boat fishing are provided for in this landscaped park set around a spring-fed estuary.

— Wailuku River State Park: This 16.3 acre park is located near Hilo. The park provides viewpoints of geologic and scenic interest along Wailuku River. Boiling Pots is a succession of big pools connected by underground flow or cascades and whose waters roll and bubbles as if boiling; the well-exposed hexagonal columns that line the pools were formed by the slow cooling of basalt lavas. The 80-foot Rainbow Falls is renowned for the rainbow formed from its mist many mornings.

2.d.(6) Na Ala Hele State Trail and Access Program

The purpose of the Na Ala Hele State Trail and Access Program is to preserve and perpetuate the integrity, condition, naturalness and beauty of State trails and surrounding areas, and to protect environmental resources (Hawai‘i Revised Statutes, Sections 198D-11 and 198D-6).

Activities allowed under this program by permit from DLNR include camping, hunting and fishing. Some trails are specified for commercial activity (e.g., commercial hikes on designated trails), but no commercial activity is permitted on a trail if it will compromise the quality and nature of the experience or cause any damage to the integrity or condition of the trail or the surrounding environment. Prohibited uses include collecting, removing, injuring or killing a plant or animal; and introducing plants or wildlife.

2.d.(7) Natural Area Partnership (NAP) Program

Under the Natural Area Partnership (NAP) program, the State provides two-thirds of the management costs for private landowners who agree to permanently protect intact native ecosystems, essential habitat for threatened and endangered species, or areas with other significant biological resources. The NAP program can support a full range of management activities to protect, restore, or enhance significant native resources or geological features.

To qualify, the applicant must be a landowner or manager of private lands of high natural area quality. Other requirements include: (1) permanent dedication of the private lands through a transfer of fee title or a conservation easement to the State or a “cooperating entity” such as The Nature Conservancy of Hawai‘i, and (2) management of the lands according to a detailed management plan approved by the Board of Land and Natural Resources. A “cooperating entity” is a private non-profit landholding organization or any other body deemed by DLNR to be able to assist in the management of natural areas.

NAP program funding is used to manage the Kona Hema Preserve and the Ka‘u Preserve on the Big Island. These areas are discussed more in detail later in the chapter under the “Other Land Management” section.

3. STATE SPECIES PROTECTIONS

3.a. Protection of Threatened and Endangered Wildlife and Ecosystems

The State has established various laws and administrative rules to protect threatened and endangered wildlife and their ecosystems. The Administrative Rule “Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds,” implements a State act that was specifically designed to conserve, manage, protect and enhance indigenous wildlife, endangered and

threatened wildlife, and introduced wild birds (Hawai'i Administrative Rules, Chapter 13-124). The State list of threatened and endangered species includes by reference species on the Federal list.

With regard to threatened and endangered wildlife species, prohibited activities include *taking*, possessing, processing, selling, offering for sale, or transporting these species ("*Take*" is defined by State law to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" (HRS § 195D-2)). Nor can their nests be removed, damaged or disturbed, or their young, eggs, dead body or skin be removed from the State of Hawai'i. Nor does DLNR issue permits to destroy or otherwise control threatened or endangered species of wildlife or introduced wildlife. However, these rules do not apply to authorized employees of DLNR, the State Department of Agriculture, and the Service if the employees are acting in the course of their official duties. Also, "incidental *takes*" are allowed subject to approved habitat conservation plans and safe harbor agreements (HRS § 195D).

Similarly, the State has established various laws and administrative rules to protect threatened and endangered plants and their ecosystems, which in turn helps protect wildlife. The Administrative Rule "Threatened and Endangered Plants," implements a State act that was specifically designed to conserve, manage, protect and enhance native threatened and endangered plants (HRS § 195D). Prohibited activities include the *taking*, selling, delivering, carrying, shipping, transporting, or exporting of any native endangered or threatened plant. However, license holders may sell such plants if the plants are garden-grown. For plants, "*take*" is defined by State law to mean "cut, collect, uproot, destroy, injure, or possess." (HRS § 195D-2). Unlike the definition of *take* applicable to wildlife, there is no prohibition on "harm" for listed plants. In addition, "incidental *takes*" are allowed subject to approved habitat conservation plans and safe harbor agreements (HRS § 195D).

As discussed above, additional protections of threatened and endangered wildlife and ecosystems are embedded in separate laws governing the State Conservation District, State Forest Reserves, State parks, and designated State trails. Also, the State has laws to protect, conserve and preserve ecosystems in NARs, as well as native ecosystems and important watersheds in State Forest Reserves. Under the NAP program, the State shares in the land management costs of private landowners who agree to permanently protect intact native ecosystems, essential habitat for threatened and endangered species, or areas with other significant biological resources. Limited taking of flora is allowed, but only in State parks and State Forest Reserves, and only if the flora is not endangered or threatened. In State parks, collecting or gathering reasonable quantities of natural renewable products–such as fruits, berries, flowers, seeds, and pine cones–is allowed for personal use without a permit. In Forest Reserves, limited colleting for personal use (e.g., *ti* leaves and bamboo) and limited commercial harvesting (e.g., timber, seedlings, greenery and tree ferns) is allowed by permit. Commercial forestry operations are allowed only with approval of the Board.

3.b. State Environmental Assessments and Environmental Impact Statements

Hawai'i State law calls for efforts to prevent or eliminate damage to the environment and biosphere and to protect endangered species and indigenous plants and animals. To meet this and other goals, Hawai'i's Environmental Impact Statement (EIS) law (Hawai'i Revised Statutes 343), which is administered by the State Office of Environmental Quality Control (OEQC), requires that an Environmental Assessment (EA) and/or EIS be prepared for many development projects. The law requires that government give systematic consideration to the environmental, social and economic consequences of proposed development projects before granting permits for construction. For impacts on biological resources, OEQC guidelines call for biological surveys, an ecosystem

impact analysis, and proposed mitigating measures. The requirements and guidelines apply to development projects in the State Agricultural, Urban, Rural and Conservation Districts.

4. COUNTY LAND MANAGEMENT

While the State manages land in the Conservation District, the counties have primary management responsibility for land in the other three State Districts: Agricultural, Urban and Rural. Also, development along the shoreline is subject to county regulation, even for land in the Conservation District.

4.a. Agricultural District

The Agricultural District includes "good" farm land and, from an agricultural perspective, land that is commonly referred to as "junk" land because it is unsuitable for farming or ranching. "Junk" land includes gulches, steep hillsides, rocky land and, on Maui and the Big Island, even relatively recent lava flows having little or no topsoil. This districting of "junk land" into the Agricultural District reflects the fact that this district is a catch-all category that includes all lands not otherwise categorized, regardless of the agricultural quality of the land.

Crops, livestock and grazing are permitted in the Agricultural District, as are accessory structures and farmhouses. On the Big Island, Agricultural land is often used for large-lot subdivisions. These subdivisions can be designed for "residential" development (i.e., housing units targeted at Big Island residents) or high-end "resort/residential" development (i.e., housing units targeted at non-Big Island residents and associated with resorts). Agricultural subdivisions typically occur on lower quality agricultural land, or "junk land."

Listed species are found in some parts of the Agricultural District, particularly in gulches, on hillsides, and on some of the land that is used for low-intensity grazing. In some cases, the fact that the land is in the Agricultural District indirectly protects listed species by limiting urban sprawl.

4.b. Rural and Urban Districting

The State Urban and Rural Districts in each county are subject to county land use and development (commercial, industrial, residential, etc.) regulations, including county community plans, zoning, and building code regulations.

4.c. Coastal Zone Management Program and Special Management Areas

As mandated by Hawai‘i Coastal Zone Management program, the county has an additional layer of regulation that provides special controls on development in Special Management Areas (SMAs) located along the shoreline. Development in an SMA requires an SMA Use Permit from the county where the development is proposed. The intent is to avoid the permanent loss of valuable resources and to ensure adequate access to beaches, recreation areas and natural reserves (Hawai‘i Revised Statutes, Chapter 205A). Although SMAs are defined to include all lands extending not fewer than 100 yards inland from the shoreline, counties can amend their boundaries to achieve certain Costal Zone Management objectives. Amendments removing areas from an SMA are subject to State review for compliance with the coastal law.

4.d. County Boards of Water Supply

Boards of Water Supply in each county own and manage land in their island watersheds in order to protect their county's supply of water. Watersheds generally include mountainous areas.

5. OTHER LAND MANAGEMENT

Other land management activities that are not the responsibility of the State or county governments are discussed below.

5.a. Preserves Involving The Nature Conservancy of Hawai'i (TNCH)

The Nature Conservancy of Hawai'i (TNCH) is a private, non-profit affiliate of a national organization that works with Federal, State and private partners to protect Hawai'i's natural areas that shelter native species. The mission of TNCH is to preserve Hawai'i's native plants, animals, and natural communities by protecting the lands and waters needed for their survival. In managing the preserves TNCH often takes advantage of Hawai'i's NAP program whereby the State provides two-thirds of the cost of managing private land dedicated to conservation (see discussion of NAP in Section 2.d.)

Management goals for the preserves include some or all of the following: (1) control non-native species; (2) suppress wildfire; (3) restore the integrity of dryland forest ecosystem; (4) reduce damage caused by feral ungulates and small mammals; and (5) prevent extinction of rare species in the preserves. General management actions taken to attain the aforementioned goals include various fencing; monitoring and researching native plant species; hunting to control ungulate population; controlling weeds; and other various programs to prevent wildfire, control non-native plants, etc. Brief descriptions of the preserves in Hawai'i County with TNCH involvement are presented below.

The Big Island maintains the following preserves:

— Kona Hema Preserve: TCNH's Kona Hema Preserve is located in south Kona on the slopes of Mauna Loa. The 5,821 acre preserve protects part of an ancient *koa-'ohi'a* forest that spans more than 100,000 acres along the leeward coast of the Big Island. Birds protected in the preserve include the endangered Hawaiian hawk, the Hawaiian hoary bat, and native songbird species such as the *'apapane*, *'i'iwi*, *'elepaio*, and *'amakihi*. Currently, there is no public access to Kona Hema. In 1999 and 2000, TNCH acquired two adjoining parcels in South Kona to form the preserve: at Honomalino, and at Kapu'a in partnership with the U.S. Forest Service. In addition to protecting the native forests and the biological values they harbor, TCNH plans to develop a model of sustainable *koa* forestry that will help other landowners maintain the biological and economic value of the land.

— Ka'u Preserve: TNCH's Ka'u Preserve is located on the southern end of the Big Island's Ka'u District, between 2,160 and 5,770 feet in elevation. The 3,548 acre Ka'u Preserve is part of the largest and most intact expanse of native forest in the state. The preserve is primarily closed-canopy *koa* and *'ohi'a* forest, with an understory of native *uluhe* and *hapu'u* tree ferns. It provides habitat for rare and endangered forest birds, including the *'io*, *'apapane*, *'i'iwi*, *'elepaio*, and *'amakihi*. Due to its rugged terrain, the

preserve is not open to the public. All four parcels consist of nearly pristine native forest and form a boundary between the largely intact native alpine and subalpine forest above, and the agricultural land below. TNCH will actively manage the land to prevent new weed invasions.

5.b. Olaʻa Kilauea Management Area

In an effort to protect native biological resources, landowners and other interested parties established a partnership to cooperatively manage the Olaʻa-Kilauea Management Area. This 32,000 acre management area includes lands owned or controlled by the Hawaii Department of Public Safety (Kulani Correctional Facility), the Hawaii Department of Land and Natural Resources (Puʻu Makeʻala Natural Area Reserve), the National Park Service (Olaʻa tract of Hawaiʻi Volcanoes National Park), and privately owned lands in Kilauea Forest.

A group of landowners and managers of the Olaʻa Kilauea Management Area as well as representatives from the Service, U.S. Geological Survey, and the U.S. Forest Service developed a five year management plan. The overall objective of management in the project area is the protection and recovery of native ecosystems to the point that they are self-sustaining, native-dominated communities with secure populations of native plant, invertebrate, and forest bird species. Management efforts are aimed at controlling feral pigs and non-native plants. As objectives for feral pig and non-native plant control are achieved and large, pig-free areas become available for more intensive management control for other predators (i.e. black rats, which eat the fruit and/or seeds of some plant species), restoration of rare plant species will be implemented. Propagation and outplanting programs are being considered for some rare plant species that appear to be inadequately reproducing in the wild or for those with inadequate genetic representation in the wild (i.e., few individuals). As rare plants are located, representative genetic material is collected and maintained at the Volcano Mid-Elevation Rare Plant Facility. In some instances spot fencing is erected for interim protection from ungulates.

5.c. North Kona Dry Forest Working Group

The North Kona Dry Forest Working Group was organized in 1996 to address recovery of dry forest ecosystems in the region. Their conservation efforts are focused on the following two areas:

— Kaʻupulehu mauka: This five acre parcel in the North Kona District is owned by the National Tropical Botanical Garden and is managed expressly for the benefit of endangered plants and their habitat. Currently, there are three endangered plant species that naturally occur within this parcel. The primary factors inhibiting the recovery of these species in this area was limited seedling growth of these dry forest trees due to altered microclimate conditions by the non-native plant fountain grass, wildfire, seed predation by rats and mice, and occasional browsing of seedlings and saplings by feral sheep and goats. A cattle fence was erected in 1950 and the cattle removed, however there are local accounts of feral sheep and goats using this area off-and-on until the fence was improved with hogwire and barbed wire in 1996. The North Kona Dry Forest Working Group focused on this five acre parcel as its pilot project. The group has since removed all of the fountain grass and thus reduced the wildfire hazard to this area. Rodent populations have also

been controlled within this unit and numerous native understory species have been planted.

— Ka‘upulehu makai: This 70 acre management unit in the North Kona District is part of a larger parcel owned by the Kamehameha Schools. Four endangered plant species naturally occur within this dry forest management unit. A sheep and goat fence was erected in 1999 by the North Kona Dry Forest Working as part of an effort to expand dry forest restoration efforts to larger areas within the region. As with Ka‘upulehu makua area, the group is in removing fountain grass, controlling rodent populations, and planting native understory species.

5.d. Hawai‘i Tropical Botanical Garden

Hawai‘i Tropical Botanical Garden is located on the Big Island, 8.5 miles north of Hilo. The Garden displays more than 2,000 species of rare native and non-native tropical plants. This non-profit nature preserve is dedicated to providing a plant sanctuary, a living seed bank, and a study center for trees and plants of the tropical world and to preserving the natural environment of Onomea Bay.

APPROACH TO THE ECONOMIC IMPACT ANALYSIS[11] CHAPTER V

This chapter presents the approach used in Chapter VI to estimate the direct and indirect economic impacts of the section 7 listing and critical habitat provisions of the Act on projects, land uses and activities in proposed critical habitat for particular species. First, the scope of the economic analysis is described. This is followed by a discussion of the analytical concepts and steps used to conduct the analysis.

1. SCOPE OF THE ANALYSIS

The parameters below define the scope of the economic analysis.

1.a. Time Horizon for the Analysis

A 10-year time horizon is used because many landowners and managers do not have specific plans for projects beyond 10 years. In addition, the forecasts in this analysis of future economic activity are based on current socioeconomic trends and the current level of technology, both of which are likely to change over the long term.

1.b. Projects, Land Uses and Activities Subject to Analysis

The analysis focuses primarily on the "reasonably foreseeable" projects, land uses, and activities that could affect the physical and biological features of the proposed critical habitat units. In turn, these are the activities that could be affected by the critical habitat designation.

"Reasonably foreseeable" projects, land uses, and activities are defined for the purposes of this report as those which are (1) currently authorized, permitted, or funded; (2) proposed in plans currently available to the public; or (3) projected or likely to occur within the next 10 years based on (a) recent economic or land-use trends, development patterns, evolving technologies, competitive advantages, etc., and (b) limits imposed by land-use controls, access, terrain, infrastructure, and other restrictions on development.

[11] **Note to Reader:** Readers who are already familiar with the approach to the analysis may wish to skip this chapter and proceed to the economic analysis in Chapter VI.

2. ANALYTICAL CONCEPTS AND STEPS

The approach used to estimate the economic impacts on specific projects, land uses and activities in areas proposed for critical habitat involved, as appropriate, the analytical concepts and steps described below.

2.a. Background Information

In order to provide context for the analysis, and to the extent that information was reasonably available, background information was obtained on projects, land uses, and activities that may potentially be affected by the proposed designation. Depending upon the situation, this background information included some or all of the following: (1) the location of a project, land use, or activity; (2) a description of the project, land use, or activity, including its magnitude; (3) the amount of economic activity associated with the project, land use, or activity (e.g., revenues and employment); (4) past section 7 consultations, project modifications and associated costs; and (5) whether the project site is within the geographic area known to be *occupied* by listed species other than those in the current proposal.

2.b. Federal Involvement

For the current and planned projects, land uses, and activities that may affect the physical and biological features of the proposed critical habitat units, the next step in the analysis was to determine *Federal involvement*. As discussed in Chapter III, Federal agencies must consult with the Service whenever an activity they fund, authorize, or carry out may affect designated critical habitat. When consultations concern an activity on Federal lands, the relevant Federal agency consults with the Service. When consultations involve an activity proposed by a State or local government or by a private entity, the Federal "Action agency" to the activity consults with the Service.

In practice, not every single project, land use, and activity that has a *Federal nexus* has been subject to section 7 consultation with the Service. Thus, the analysis of direct impacts was further confined to those projects, land uses, and activities which are, in practice, likely to be subject to consultation. This assessment was based on a review of past consultations, current practices, and the professional judgments of Service and other Federal agency staff.

Activities on State, county, municipal and private lands that do not have a *Federal nexus* (i.e., they do not involve Federal funding, a Federal permit, or other Federal actions) are not directly restricted by section 7 of the Act. However, these projects may be indirectly affected by the designation of critical habitat, as discussed below. Therefore, these activities are addressed in the analysis.

2.c. Exclusion of Man-Made Features and Structures

In practice, the critical habitat provisions of section 7 do not apply to the operation and maintenance (O&M) of existing man-made features and structures because these features and structures normally do not contain, and are not likely to develop, any *primary constituent elements.* For this reason, such features or structures were excluded from critical habitat by the proposed rule. Examples of man-made features and structures include buildings, roads, aqueducts, telecommunications equipment, arboreta and gardens, and *heiau* (indigenous places of worship or shrines). As a result, O&M of man-made features and structures were not considered further in the analysis.

2.d. Existing Protections

The next step in the analysis involved identifying the impacts on activities that were expected to result from existing protections unrelated to section 7 (e.g., other existing Federal, State, and county land-use controls and environmental protections). If some other existing statute, regulation, or policy limits or prohibits a project, land use, or activity, the economic impacts associated with those limitations or prohibitions are not attributable to section 7 listing provisions and/or critical habitat provisions. For example, State protections include land-use restrictions for activities in the State Conservation District and specific protections of threatened and endangered species and their ecosystems.

2.e. Consultations and Project Modifications

For current and planned projects, land uses, and activities that are likely to be subject to consultations under section 7 of the Act, the next step in the analysis was to estimate (1) the quantity and nature of the consultations (e.g., formal or informal); and (2) changes that are likely to occur in such items as project designs, schedules, land uses, activities and programs.

The estimates reflect the availability of information which, in many cases, was limited (e.g., the outcome of future consultations will not be known until they occur).

2.f. Direct Economic Costs

The next step in the analysis was to estimate the costs of consultations and the changes to projects, land uses and activities prompted by implementing the section 7 provisions. The types of economic costs that were considered included, but were not limited to, changes in revenues, costs, and property values.

In some cases, costs were described but were not quantified for one or more of the following reasons: (1) the economic impacts attributable to section 7 of the Act are expected to be small; (2) the probability that the impacts will occur is small; (3) the impacts are highly speculative; or (4) data needed to quantify impacts are not reasonably available.

2.g. Indirect Costs

As mentioned above, certain projects, land uses, and activities that are not subject to section 7 of the Act may still be impacted indirectly by the designation of critical habitat. This would occur if State and county officials, courts, landowners, buyers and sellers of land, potential project investors, lenders, environmental groups, and community groups were to treat projects, land uses, and activities in critical habitat differently than they would treat identical projects, land uses, and activities outside of critical habitat. Whenever possible, quantitative assessments of indirect costs were made. However, the magnitude of some impacts and/or the probability of occurrence are unknown. In these cases, the possible impacts were discussed qualitatively.

2.h. Costs to Small Entities

All of the entities affected by the section 7 listing and critical habitat provisions of the Act were evaluated to determine which, if any, are considered a small entity by the U.S. Small Business Administration (SBA) standards. An analysis was then done to determine if a substantial number of small entities will be significantly impacted, according to SBA guidelines.

2.i. Direct Economic Benefits

The next step in the analysis was to estimate the benefits (e.g., species preservation) associated with the section 7 listing and critical habitat provisions. In most cases, a qualitative discussion of benefits is provided because (1) scientific studies are not available on the magnitude of environmental changes due to critical habitat, and (2) market prices or existing economic studies on which to base values are not available (e.g., the economic value of preserving certain species).

2.j. Indirect Economic Benefits

The final step in the analysis was to estimate the indirect benefits associated with the section 7 critical habitat provisions. In most cases, a qualitative discussion of benefits is provided because (1) the probability that the indirect effect will occur is unknown, (2) scientific studies are not available on the magnitude of environmental changes due to critical habitat, and (3) market prices or existing economic studies on which to base values are not available.

3. SOURCES OF INFORMATION

The approach described above relied primarily on information provided by the Service (GIS map overlays, acreage tables, public testimony, comment letters on prior critical habitat proposals, consultation files, etc.); the State Department of Business, Economic Development & Tourism; county planning and finance departments; other Federal, State and county agencies; public and private landowners and land managers; affected companies; and other interested parties. Public documents used included the proposed rule, *Hawai'i Revised Statutes* and *Hawai'i Administrative Rules* related to land use, *The State of Hawai'i Data Book,* applicable county land-use plans, and property tax data.

ECONOMIC COSTS AND BENEFITS **CHAPTER VI**

1. INTRODUCTION

As noted in the Foreword, the Service may exclude an area from critical habitat designation if it determines that the benefits of excluding the area outweigh the benefits of inclusion. To aid in this determination, this chapter presents an analysis of the section 7-related economic costs and benefits associated with listing the plants as threatened and endangered species and with designating critical habitat for the plants. However, the Service cannot exclude an area if it determines that the exclusion will result in the extinction of the species.

As explained in Chapter V, the approach used in this economic analysis involves estimating the total section 7-related economic costs and benefits (also referred to as economic impacts) of the plant listings and critical habitat designation. That is, for each potential impact, the analysis presents the economic impacts likely to occur under section 7 of the Act due to both the species listing and the designation of critical habitat.

The discussion and analysis of costs and benefits in this chapter is divided into the following sections: section 7 consultation history and typical costs (Section 2), direct section 7-related costs (Section 3), indirect costs (Section 4), potential impacts on small entities (Section 5), and section 7- related economic benefits (Section 6). A summary of the direct and indirect costs and benefits is given in Section 7. For some land-use activities and projects, the implementation of section 7 of the Act may generate both direct and indirect costs, or both costs and benefits, etc. As a result, the analysis of economic impacts for some land-use activities and projects is split among two or more sections, as appropriate.

2. SECTION 7 CONSULTATIONS

In order to provide a context for the analysis in Section 3 below, this section gives a summary of the past consultations that concerned one or more of the listed plants. It also presents the costs generally associated with section 7 consultations, biological surveys and associated project modifications. This information is used in Section 3 below to estimate future section 7-related economic impacts.

2.a. History of Section 7 Consultations and Project Modifications

Service records indicate that the Service has conducted two formal and 20 informal section 7 consultations since the 47 plants species were listed between 1991 and 1996. One formal and 11 informal consultations were conducted with the Army, four informal consultations were conducted

with Army Corps of Engineers, three informal consultations were conducted with the National Park Service, and one formal consultation was conducted with the U.S. Department of Transportation Federal Highways Administration. The proposed rule contains more detailed information on these historical section 7 consultations (67 FR 37069).

2.b. Cost of Section 7 Consultations, Biological Surveys and Project Modifications

2.b.(1) Focus of Consultation

For the plants, the proposed rule indicates that future section 7 consultations are likely to focus on projects and activities that, among other issues, could directly or indirectly adversely affect critical habitat, including:

— Activities that appreciably degrade or destroy *the primary constituent elements* including but not limited to: overgrazing; maintenance of feral ungulates; clearing or cutting of native live trees and shrubs, whether by burning or mechanical, chemical, or other means (e.g., woodcutting, bulldozing, construction, road building, mining, herbicide application); introducing or enabling the spread of nonnative species; and taking actions that pose a risk of fire.

— Activities that alter watershed characteristics in ways that would appreciably reduce groundwater recharge or alter natural, dynamic wetland or other vegetative communities. Such activities may include water diversion or impoundment, excess groundwater pumping, manipulation of vegetation such as timber harvesting, residential and commercial development, and grazing of livestock or horses that degrades watershed values.

— Rural residential construction that includes concrete pads for foundations and the installation of septic systems.

— Recreational activities that appreciably degrade vegetation.

— Mining cinder, sand or other minerals.

— Introducing or encouraging the spread of non-native plant species.

— Importing non-native species for research, agriculture, and aquaculture, and releasing biological control agents that would have unanticipated effects on the *primary constituent elements* of designated critical habitat.

2.b.(2) Cost of Consultation

As discussed in Chapter III, participants in a consultation may include the Service, the Federal Applicant or Federal Action agency, and possibly a non-Federal applicant. Although the Service does not charge fees for its consultations, participants in consultations normally spend time assembling information about the site and the proposed project or activity; preparing for one or more meetings; participating in meetings; arranging for biological surveys and any associated reports; and responding to correspondence and phone calls.

For three levels of complexity (Low, Medium or High), Table VI-1 gives the estimated cost to those participating in consultations with the Service. The estimate is based on: (1) a review of consultation records across the country related to other critical habitat rulemakings; (2) the typical amount of time spent by all participants; and (3) the relevant standard hourly rates and overhead allowances for the Service, other Federal agencies, and private applicants in Hawai‘i.

Table VI-1
Estimated Cost of a Section 7 Consultation

Item	Low	Medium	High
Consultation			
Federal Action Agency or Federal Applicant	$2,200	$6,400	$10,700
U.S. Fish and Wildlife Service	$1,600	$5,100	$10,000
Total for Federal Agencies	$3,800	$11,500	$20,700
Non-Federal Applicant (if any)	$1,400	$4,200	$8,200
Total (if a Non-Federal Applicant)	**$5,200**	**$15,700**	**$28,900**

Source: Project consultants and U.S. Office of Personnel Management, 2002 General Schedule Salary Table.

As indicated in the table, consultation costs could range from as little as $3,800 to as much as $20,700 if just Federal agencies are involved, and from $5,200 to $28,900 if there is a non-Federal applicant.

2.b.(3) Cost of Biological Survey

The cost of a biological survey for a particular piece of land and a technical report on the findings varies according to a number of parameters:

— Size of the land area: The consultation history for a variety of listed plants suggests that projects are of three sizes: small (fewer than 10 acres), medium (11-100 acres), or large (101-500 acres). Large land areas take longer to survey and thus are more costly to survey.

— Ease of access to the site: Some sites can be reached easily while others can be reached only by helicopter. More remote sites are more costly to survey.

— Type of ecosystem: Forested areas are more difficult to survey than open areas and therefore are more costly to survey.

Based on these parameters, Table VI-2 presents estimates of the cost to survey land areas with different combinations of features and to prepare the report on the findings. The estimates assume the following: (1) a three-person team can survey 100 acres in one day if the area is open, and 30 acres if it is forested; (2) sites having "easy" access can be reached in an hour of driving or hiking, "medium" access takes 2 hours, and "difficult" access takes a half-hour by helicopter; (3) biologist and field-assistant services are $50 to $80 per hour; (4) travel costs for the survey team are $1,000 to $1,500 for round-trip airfare from O‘ahu, car rental, and per diem; and (5) helicopter time is $700 per hour.

Table VI-2
Estimated Cost of Biological Surveys for Threatened and Endangered Plants

Size and Location	Accessibility		
	Easy	**Medium**	**Difficult**
10 Acres, Open or Forested Area	$3,700	$3,900	$5,100
100 Acres, Open Area	$4,500	$4,900	$5,900
100 Acres, Forested Area	$10,200	$11,400	$14,900
500 Acres, Open Area	$15,900	$17,700	$22,900
500 Acres, Forested Area	$44,600	$50,600	$67,900

Source: Project consultants. Based on discussions with a Hawai'i-based biological consulting firm in 2002.

As Table VI-2 indicates, the costs of a biological survey could range from as little as $3,700 in a 10-acre, easily accessible, open area to as much as $67,900 in a 500-acre, remote, forested area. The estimates are based on average projects of each type; specific projects of each type may require more or less survey effort than the average used in the cost estimates, depending on the characteristics.

2.b.(4) Costs of Project Modifications

At some point before or during a section 7 consultation, an applicant may develop one or a series of modifications to a planned or on-going project. The goal of these project modifications will be to reduce the effect a project or activity has on listed species. The applicant may develop these modifications alone or in concert with the Federal Action agency and/or the Service.

An applicant is not required to develop or complete project modifications developed prior to or during and informal section 7 consultations. However, in certain cases, if project modifications are not developed, the Federal Action agency may determine that the project may affect listed species or critical habitat and a formal section 7 consultation will be required. The formal section 7 consultation process can be more costly and time consuming than the informal process, so applicants may elect to develop project modifications during the informal section 7 consultation in order to avoid a formal section 7 consultation.

Unless a project results in "take" of a listed species (which does not apply to listed plants in the Act), formal section 7 consultations does not require project modifications unless the project is likely to jeopardize the species or destroy or adversely modify critical habitat. Applicants will often modify their projects in order to avoid causing jeopardy to the species or adverse modification to critical habitat. These project modifications may be developed by the applicant and the Federal Action Agency with assistance from the Service and incorporated into the description of the proposed project. Alternatively, if the planned project is likely to jeopardize the species or destroy or adversely modify critical habitat, the project modifications may be developed by the Service with assistance from the applicant and the Federal Action Agency and presented as a reasonable and prudent alternative in a Biological Opinion provided by the Service.

Project modifications designed to avoid an informal section 7 consultation, a formal section 7 consultation, jeopardy to a species, or adverse modification to critical habitat all have the same goal: to minimize the direct or indirect effect of a project or activity on listed species. As such, the

costs associated with project modifications for a particular project will be similar if the project is at the informal consultation stage or at the formal consultation stage. In fact, an applicant may agree to a more costly project modification during and informal consult in order to avoid the costs associated with the formal section 7 consultation process.

For the purposes of this analysis, any modification to a project or activity that would not have occurred absent section 7 of the Act is referred to as a "project modification." Since the economic costs are similar for project modifications developed at each stage of the section 7 consultation process, a distinction is not made between informal project modifications and formal project modifications.

Based on a review of the files associated with historical section 7 consultations that include the listed plants on the Big Island, project modifications are specific to each type of project, its location, and the listed plant or plants affected. As such, the project modification costs are determined on a project-by-project basis in Section 3 below.

3. DIRECT SECTION 7-RELATED COSTS

The following analysis of direct section 7-related costs addresses ongoing land-use activities in the proposed critical habitat, but excludes certain areas and manmade features and structures that are not considered to be part of the proposed critical habitat because they are known not to contain the *primary constituent elements* for the plants (see Chapter I). The analysis also addresses foreseeable developments and major land-use changes in the proposed critical habitat.

3.a. Management of Game Hunting

Presented below is an analysis of the direct economic impacts of the proposed critical habitat designation on the management of game hunting on State lands. Additional impacts are addressed in Section 4, "Indirect Costs," while Appendices VI-A and VI-B provide background information on hunting and game-mammal management.

Affected Hunting Acreage

Fifteen of the 42 proposed critical habitat units overlap with State-managed hunting lands:

- Units A1, A2, K, and T overlap with parts of State Hunting Unit B
- Unit B overlaps with parts of State Hunting Units B, K, and D
- Unit E overlaps with parts of State Hunting Unit C
- Unit F overlaps with parts of State Hunting Units B, C and K
- Unit G overlaps with parts of State Hunting Units B, D, E, H and K
- Unit H overlaps with parts of State Hunting Units B and J
- Units J, Q, and S overlap with parts of State Hunting Unit K
- Unit M3 overlaps with parts of State Hunting Unit I
- Unit Z overlaps with parts of State Hunting Unit J

These overlapping areas represent almost 185,400 acres, or 27 percent of the total State-managed hunting units on the Big Island.

Critical habitat Units Z (Pu‘u Wa‘awa‘a) and AA (Pohakuloa Training Area (PTA)) overlap with areas that are very popular with game mammal hunters due to their good access and large

number game mammals. In 1996, the Service helped the hunting community establish a list of places to safeguard for the future of hunting. Pu‘u Wa‘awa‘a and PTA were identified as top priorities on the list. In addition, Forest Reserves are popular hunting spots for pig hunters. Proposed critical habitat units A1, A2, B, E, F, G, H, K, M3, T, and X all contain Forest Reserves that are used for hunting.

As a result, while the proposed critical habitat only covers 27 percent of the total hunting area on the Big Island, the actual hunting activity in these units is higher than 27 percent. Based information provided by the State Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) regarding the popularity and the number of hunting trips in the Pu‘u Wa‘awa‘a, PTA, and the Forest Reserves, it is assumed the portions of the State Hunting Units included in critical habitat support approximately 75 percent of the hunting activity on the Big Island.

Private lands on the Big Island may be available for game hunting, though not managed by DLNR as State Hunting Units. However, public access to private lands is limited and subject to change, based on landowners’ actions.

Potential Project or Activity, Next 10 Years: Game management and hunting-related projects.

Based on a statewide consultation on hunting in 2001 (see Appendix VI-A) the draft Pu‘u Wa‘awa‘a management plan, and the 2001 PTA Integrated Natural Resources Management Plan (INRMP), game management and hunting-related projects on the Big Island may include maintenance or construction of hunter check-in stations, game mammal surveys, managing highly degraded areas for game mammal hunting as a sustained yield resource, utilizing public hunting to control feral ungulate populations in conservation areas, promoting youth and disabled hunter programs, researching game mammal and game bird populations to guide future hunting program designs, controlling game bird predators such as mongooses and feral cats, providing water to game birds by installing game bird guzzlers, etc.

Federal Involvement: Federal cost-sharing of many DLNR game-management projects, and federally controlled access to PTA lands.

Federal funding is provided by the Service to DLNR to restore and rehabilitate wildlife habitat and to support wildlife management research. The funding is provided as part of the Pittman- Robertson Act (see Appendix VI-A, Section 7). The Army controls access to the State managed hunting units on PTA.

Consultation and Costs:

- Total Section 7 Costs: $6,440 to $21,260

No consultations are required for game management projects that 1) do not affect listed species or their habitats; 2) are entirely funded by the State (even if they do affect listed species or their habitats); or 3) are undertaken by private parties on privately-owned land.

The Service has historically conducted internal consultations involving DLNR on game-management projects that are partially funded under the Pittman-Robertson Act due to the *Federal nexus* and the presence of listed plants and wildlife throughout much of the State hunting lands. However, if the proposed critical habitat is designated, the scope of future section 7 consultations

will be expanded to include portions of the critical habitat where no listed species are present. The main issue for the consultation is likely to be the impact of ungulate activity on native plants and their habitat.

Statewide consultations between DLNR and the Service occur every five years, and the last consultation took place in 2001. Therefore, two programmatic consultations are likely over the next 10 years. The 2001 consultation cost the Service and DLNR approximately $27,600. The cost was high because new issues were raised. Without critical habitat designation, information from the Service and DLNR suggests that the next two consultations would have each cost about 50 to 75 percent of the 2001 consultation, or about $13,800 to $20,700 statewide. Two consultations over the next 10 years would increase the total statewide cost to about $27,600 to $41,400.

Many of the projects proposed for Pittman-Robertson funding apply to all six islands. Thus, by allocating the portion of consultation costs attributable to each island equally, the Big Island's share over the next 10 years would be $4,600 to $6,900 ($27,600 x 1/6; $41,400 x 1/6) each. Alternatively, 28 percent of the State's hunting fiscal year 2001 hunting budget was spent on projects on the Big Island. Assuming consultation costs were incurred in relation to the amount of State money spent allocated to the Big Island projects, the Big Island's share of consultation costs over the next 10 years would $7,730 to $11,590 ($27,600 x 28 percent; $41,400 x 28 percent). Using these two methods to allocate the share of the consultation costs, a conservative estimate over the next 10 years would be $4,600 to $11,590 for the Big Island.

However, future consultations may address areas that have not been considered before critical habitat designation. Given the fact that no plant-related critical habitat consultations have taken place on the Big Island, no estimates are available for the cost increase associated with the designation. However, it is likely that while future consultations will involve a much larger area, they likely will address about the same number of game-management projects, involve about the same number of staff, and involve staff who are already familiar with the issues. Given these factors, the increase in costs is estimated at 20 to 50 percent because critical habitat may increase the level of effort required to analyze the effects of feral ungulates, especially in areas that are *unoccupied* by the listed plants. This increases the 10-year consultation cost for the Big Island to between $5,520 to $17,390.

Also, the 2001 consultation on Pittman-Robertson funding may be re-initiated due to critical habitat designation. During the re-initiation, the Service is likely to address areas that have not been considered before critical habitat designation. However, since the most of the biological issues relating to the listed plants were resolved in the original consultation, the re-initiation is likely to involve a low level of effort. Similar to the above, the assumed cost is 20 to 50 percent of the initial cost of $27,600. Depending on the method of allocation, the Big Island's share of the 2001 consultation cost was between $4,600 to $7,730 ($27,600 x 1/6; $27,600 x 28 percent). About 20 to 50 percent of this amount is $920 to $3,870.

Access to State Hunting Units and feral ungulate control on PTA will be included in the Army's programmatic PTA consultation, discussed in Section 3.f. below.

Thus, the total projected consultation costs for the Big Island over the next 10 years are $6,440 to $21,260 including:

— One re-initiation at $920 to $3,870; and
— Two new programmatic consultations at $2,760 to $8,695 each.

All of the consultation costs are conservatively assigned to the plant listings and critical habitat, even though the consultation may also address listed wildlife species and associated critical habitat that may be present.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: $36,670 and $61,600

For the most part, DLNR can avoid costly project modifications by using Pittman-Robertson funds for game-management projects that do not adversely affect listed species or their habitat and, if needed, use only State funds on projects that the Service believes could have adverse impacts. By doing there would be no *Federal nexus*. For example, in the existing draft management plan for Pu‘u Wa‘awa‘a, any project designed to maintain or enhance game mammal populations will be funded with State money, and the remaining projects will be funded with Pittman-Robertson funds. Thus, required project-modification costs are expected to be minor.

Nevertheless, to avoid adverse impacts to the plants and their habitat, funds may have to be diverted from other potential game management projects. For example, the 2001 consultation resulted in funds being expended to prevent game mammals from using federally-funded game-bird watering stations at an average cost of about $1,000 each.

Over the next two consultations, the costs of project modifications are expected to be similar to the 2001 costs, or about $110,000 statewide for each consultation (see Appendix VI-A). Depending on the method of allocation, for the next two programmatic consultations, the Big Island’s share would be between $36,670 and $61,600 (2 x $110,000 x 1/6 (pro rata share); 2 x $110,000 x 28 percent (budget)).

The proposed critical habitat includes areas *unoccupied* by the listed plants species. However, all of the *unoccupied* areas are in the same general location as the *occupied* areas. Since feral ungulates can roam freely through much of the natural areas on the Big Island, past consultations on game management have included modifications to projects in the general location of the *occupied* areas. As such, the designation of critical habitat is not likely to increase the number or costs of game management project modifications.

Potential Entities Impacted:

Federal: Service
State: DLNR

3.b. Residential Development

3.b.(1) Department of Hawaiian Home Lands

Approximately 5,405 acres in Units B, E, F, G, M1, M2, N2, and O are managed by the Department of Hawaiian Home Lands (DHHL). The mission of DHHL is to manage the Hawaiian Home Lands trust effectively and to develop and deliver land to Native Hawaiians. To that end, DHHL recently completed the *Hawai'i Island Plan* (2002) which provides a summary description and evaluation of the 116,963 acres it owns on the Big Island.

The *Hawai'i Island Plan* identifies the regions and types of development that are most desired by the Native Hawaiian beneficiaries. It then evaluates all of the DHHL parcels on the Big Island based on slope, soils, water availability, access, proximity to existing infrastructure, and parcel size. Based on this information, the *Hawai'i Island Plan* identifies all DHHL parcels as either priority or non-priority for development. Priority parcels may be developed in the next 20 years, while non-priority parcels may be developed at some point after 20 years.

The following is a summary of the **priority** DHHL parcels in critical habitat:

— Kealakehe (priority): Approximately 1.8 acres of this parcel are in Unit Y2 and are recommended for homestead residential use. Based on the average planned lot size (7,500 square feet or 0.17 acres) and the location of the existing road, this area could support 10 to 11 home lots.

— Humu'ula-Upper Pi'ihonua (priority): Approximately 786 acres of the western portion of Unit E, 86 acres of the southern portion of Unit F, and 6 acres of the northwestern portion of Unit G overlap with the parcel. The 872 acres in Units E and F are recommended for general agricultural lots. Based on the average planned lot size and the locations of existing roads, this area could support two to three home lots. The six acres in Unit G are in the Conservation District and are not planned for development.

The following is a summary of the **non-priority** DHHL parcels in critical habitat:

— Kawaihae (non-priority): Approximately 2,193 acres of this parcel are in Unit B and are recommended for general agriculture. Development of this parcel is constrained by geo-physical conditions (gulches, gullies, slopes).

— Keoniki (non-priority): Approximately 295 acres of this parcel are in Unit B and are recommended for large lot pastoral homesteads. Development of this parcel is constrained by access and steep slopes.

— Pauahi (non-priority): Approximately 400 acres of this parcel are in Unit B and are recommended for large lot pastoral homesteads. Development constraints for this parcel are not identified in the Hawai'i Island Plan, but based on location, are likely to be similar to the Keoniki Parcel above.

— Keaukaha Tract-2 (non-priority): Approximately 46 acres of this parcel are in Unit M1 and are recommended for special district use. Development of this parcel is constrained by limited access, *tsunami* inundation potential, and noise from the Hilo Airport.

— Maku‘u Makai (non-priority): Approximately 104 acres of this parcel are in Unit M1 and are recommended for general agricultural use. Development of this parcel is constrained by water and sewer system needs and associated high costs.

— Kama‘oa-Pu‘ueo (non-priority): Approximately 1,047 acres of this parcel are in Unit N2 and are recommended for general agricultural, and special district uses. An additional 441 acres of this parcel are in Unit N2 and are recommended for homestead pastoral and general agricultural uses. A portion of the parcel in Unit N2 was subdivided on paper (i.e., not officially subdivided) in the 1970’s, but due to funding constraints, the area has not been developed. Future development of this parcel is constrained by climate and geographic isolation from the employment centers in East and West Hawai‘i.

While the proposed critical habitat overlaps with a large fraction of DHHL parcels, most of these parcels are not identified as priority areas for development due to the reasons listed above. Only the Humu‘ula-Upper Pi‘ihonua and the Kealakehe parcels are identified as priority areas for development. The portions of these parcels included in critical habitat could support the construction of approximately 12 to 14 homes over the next 10 years.

Potential Project or Activity, Next 10 Years: Residential construction

Federal Involvement: Loan Insurance or Guarantee by U.S. Department of Housing and Urban Development (HUD)

HUD sponsors loan insurance and loan guarantee programs that assist Native Hawaiians to become homeowners. Under these programs, HUD does not make the loan or provide financing. Rather, HUD insures the lender against loss in the event of a default. Because of these programs, the lender may be more willing to provide financing than it would be without the program. HUD expects the two programs to enable Native Hawaiians to tap a variety of mortgage financing programs that would not otherwise be possible.

Consultation and Costs:

C Total Section 7 Costs: $70,200 to $84,500

Estimate is based on the following: (1) 12 to 14 consultations, (2) Low cost from Table VI-1 of a consultation with a Federal agency as the Applicant and the involvement of a non-Federal entity, and (3) the cost of two to three biological surveys, based on a less than 10-acre open home site with medium access at Humu‘ula-Upper Pi‘ihonua. The Kealakehe parcels have already been surveyed as part of the Villages at La‘i‘opua project (see below). They do not contain any listed plants.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: Minor

Residential construction involves clearing and grading the home site. Since the development on the Humu‘ula-Upper Pi‘ihonua parcel will be low-density (approximately one home per 350 acres), there will be flexibility to locate the homes in areas that do not affect the listed plants or their *primary constituent elements*. As such, the costs associated with project modifications are expected to be minor.

The Kealakehe parcel is located on the opposite side of a road from the rest of Unit Y2 and does not contain any listed plants. Critical habitat only covers 1.8 acres of this parcel. As such, no project modifications are anticipated.

Potential Entities Impacted:

Federal: Service, HUD
Private: Lending institutions, Native Hawaiian lessees (individuals)

3.b.(2) Villages at La‘i‘opua

Approximately 480 acres of Unit Y2 are contained within the Housing and Community Development Corporation of Hawai‘i’s (HCDCH) Villages at La‘i‘opua (VOLA), a 1,000 acre master-planned residential community. VOLA is divided up into 14 separate villages, a municipal golf course (discussed in the Golf Courses section below), a commercial area, and several planned preserves for endangered plants.

Proposed critical habitat Unit Y1 contains the following components of the VOLA project:

— Two acres (three percent) of Village 4
— 14 acres (59 percent) of Village 5
— 22 acres (68 percent) of Village 6
— 34 acres (96 percent) of Village 9
— 22 acres (100 percent) of Village 10
— 21 acres (100 percent) of Village 11
— 153 acres (79 percent) of the planned golf course
— 27 acres (100 percent) of the endangered Aupaka (*Isodendrion pyrifolium*) plant preserve
— Three acres (100 percent) of a smaller Aupaka preserve
— Five acres (94 percent) of a park in Village 6
— 167 acres (56 percent) of a parcel in the Agricultural District that is planned for Villages 12, 13, 14, a village center, and elementary school, and a park.
— 10 acres of existing roads

The major infrastructure (roadways, drainage system, water system, and utility lines) has been completed for most of the area in the proposed critical habitat. HCDCH is currently seeking third- party developers to install the remaining infrastructure within each village and develop the lots or homes for sale.

The villages that currently have development plans include Village 4 (DHHL) and a portion of Village 6 (Hawai‘i Youth Patrons). Village 4 is also known as the DHHL Kealakehe parcel and is discussed in the previous section. The Hawai‘i Youth Patrons plan to build a youth center adjacent to the existing Kealakehe High School in a portion of Village 6 and the adjacent park.

HCDCH has not yet found developers for the other seven Villages in critical habitat, but some of them are likely to be developed in the next 10 years. According to the draft *Mitigation Plan for Threatened and Endangered Plant Species, Villages at La‘i‘opua* (1998) any development of Village 5 will require expenditures to manage the adjacent 27-acre Aupaka preserve. As such, this village may not be developed, and the preserve may not be managed, within the next 10 years.

Potential Project or Activity, Next 10 Years: VOLA planned development

Federal Involvement: None

The VOLA project did have *Federal involvement* in 1990 because EPA funds were used to build an off-site wastewater treatment plant. However, once the plant was completed, the *Federal involvement* for the project ended.

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement*.

Potential Entities Impacted: None

3.b.(3) Other Residential Development – Agricultural District

Land in the Agricultural District is generally used for crops, livestock, and grazing as well as for accessory structures and farmhouses. On the Big Island, land in the Agricultural District is also used for large-lot residential subdivisions. Subdivisions typically occur on lower quality agricultural land. In addition, the probability of the State redistricting land for urban uses is higher for land in the Agricultural District than land in the Conservation District.

While agricultural subdivisions are more common on the Big Island than elsewhere in the State, they still must be approved by the county. Zoning in the Agricultural district designates the minimum lot size for the subdivision. For example, a landowner who owns an 80 acre parcel that is zoned Agriculture-40 can only build two homes (80 / 40). However, if the same landowner gets a zoning amendment from the county to Agriculture-5, than the landowner can build 16 homes (80 / 5). The county also considers the nature of neighboring communities, proximity to existing roads and infrastructure, other land management, and the agricultural value of the land when approving or denying subdivisions and zoning amendments (Hawai‘i County Planning Department, 2002).

Approximately 69,518 acres of the proposed critical habitat designation are within the State Agricultural District, in all of the units except A2, C, M5, X, and BB. Potential residential development in the Agricultural District for the remaining units is discussed below:

— Unit A1: All of the 32 acres in the Agricultural District are privately owned. This land is located along the edge of a steep valley and is far from existing roads, infrastructure, and development. As such, residential development is not anticipated in the next 10 years.

— Unit B: Of the 10,152 acres in the Agricultural District, approximately 5,265 acres are privately owned. The largest private landowner (3,923 acres) indicated they currently have no plans for a residential subdivision (Queen Emma Foundation, 2002). The remaining 1,341 acres are zoned Agriculture-40, so they could support roughly 34 homes. A zoning amendment is not anticipated due to the agricultural importance of the land.

— Units D1 through D8: All 1,305 acres of land in the Agricultural District are *pu'us* (cinder cones) and small portions of surrounding pasture land. This land is not anticipated to be developed in the next 10 years due to the cultural significance of the *pu'us* and the distance from existing residential infrastructure.

— Unit E: Of the 4,209 acres in the Agricultural District, approximately 128 are privately owned land. These parcels are zoned Agriculture-40, so they could support three homes with the current zoning. Higher density development at these sites is not anticipated due to its distance from infrastructure and development.

— Unit F: Of the 4,579 acres in the Agricultural District, approximately 960 are privately owned land. All of this land is owned by Parker Ranch and is zoned Agriculture-40, so it could support 24 homes with the current zoning. However, development at this site is not anticipated due to its distance from existing infrastructure and development.

— Unit G: All 8,432 acres of land in the Agricultural District are privately owned by Kamehameha Schools. Kamehameha Schools does not have plans for residential development in any of the parcels included in critical habitat (Kamehameha Schools, 2002).

— Unit H: Of the 302 acres in the Agricultural District, all 212 private acres are owned by Kamehameha Schools. As mentioned above, Kamehameha Schools does not have plans for residential development in critical habitat.

— Unit I: All 20 acres of land in the Agricultural District are privately owned by Kamehameha Schools. As mentioned above, Kamehameha Schools does not have plans for residential development in critical habitat.

— Units K, L, M1, M2, M4, N1, N2, and U: None of the combined 9,312 acres in the Agricultural District in these units are privately owned. Residential development on the DHHL lands in these units is discussed earlier in this section. Additional residential development is not anticipated on any of the other publicly owned Agricultural land.

— Unit M3: Of the 55 acres in the Agricultural District, approximately 49 are privately owned. Kamehameha Schools owns 20 of these acres and does not have plans for residential development in critical habitat. The remaining 29 acres are zoned Agriculture-1, so they could support 29 homes.

— Unit O: Of the 531 acres in the Agricultural District, approximately 90 are privately owned. This land is zoned Agriculture-20, so it could support roughly five homes. Higher density development is not anticipated due to the hot climate and isolation from the population centers of the Big Island.

— Unit P: All 1,351 acres in the Agricultural District are privately owned. The land is currently zoned Agriculture-20 and it is located along the highway, so it could support roughly 68 homes. However, the National Park Service is considering purchasing most of the private land in this unit. If the sale is completed, no residential development will occur. If the sale is not completed, the land may be sold for another use such as residential development (S. M. Damon Estate, 2002)

— Unit Q: Of the 2,295 acres in the Agricultural District, approximately 991 are privately owned by one landowner. The landowner does not currently have plans for residential development land in critical habitat.

— Unit R: Of the 131 acres in the Agricultural District, approximately 125 are privately owned. The land is currently unplanned by the county. It is important agricultural land and is not likely to be subdivided in the next 10 years.

— Unit S: Of the 114 acres in the Agricultural District, approximately 48 are privately owned by one landowner. The landowner does not currently have plans to subdivide the land in critical habitat (C. Q. Yee Hop & Co. Ltd., 2002).

— Unit T: All of the 492 acres in the Agricultural District are privately owned by one landowner. The landowner does not currently have plans to subdivide the land in critical habitat (C. Q. Yee Hop & Co. Ltd., 2002).

— Unit V: All of the 1,077 acres in the Agricultural District are privately owned. Kamehameha Schools owns 761 of these acres and does not have plans for residential development in critical habitat. The remaining 316 acres are part of the master planned 11,200-acre Kealakekua Ranch Lands agricultural subdivision. According to the 1993 Environmental Assessment for this subdivision, all 316 acres of the development that are included in Unit V are planned for an agriculture park and reforestation with koa and other native trees. Agriculture and forestry are discussed in Sections 3.d. and 3.e.

— Unit W: All 3,654 acres in the Agricultural District are owned by Kamehameha Schools, which does not have plans for residential development in critical habitat.

— Unit Y1: Of the 90 acres in the Agricultural District, 83 are privately owned. This land does not have publicly available plans for development, but based on nearby agricultural subdivisions, it could be subdivided into one acre lots. This would result in roughly 83 new homes.

— Unit Y2: There is no privately owned land in the Agricultural District. The State HCDCH and DHHL plans for development in this unit are discussed in the earlier in this section.

— Unit Z: Of the 19,263 acres in the Agricultural District, 2,713 are privately owned. Kamehameha Schools owns 2,606 of these acres does not have plans for residential development on 1,766 acres. However, the remaining 840 acres are under a long-term lease to PIA-Kona Limited Partnership (PIA). PIA plans to develop this area with low density agricultural lots, a dry land forest preserve, and a lava flow reserve. The development is planned to be consistent with existing zoning of Agriculture-5, so the area in critical habitat could support roughly 170 homes. The remaining private parcels in Unit Z are existing homesteads. Based on the current zoning, these parcels cannot support more than one to two additional homes.

— Unit AA: All 1,948 acres in the Agricultural District are privately owned by Parker Ranch. The Army currently leases this land for training maneuvers, and is negotiating a purchase of the land. In addition, it is adjacent to the PTA so it is not an ideal location for residential homes. As such, residential development is not anticipated at this site.

In sum, agricultural land in proposed critical habitat Units E, M3, O, V, Y1, and Z could be subdivided at some point in the future. However, only Units V and Z have publicly available subdivision plans, and there are no homes planned in Unit V.

Potential Project or Activity, Next 10 Years: Residential development

Federal Involvement: None

Most of the units that could support residential development in the Agricultural Districts are either hot, dry, or at high elevation where there are no natural streams or drainages that require an U.S. Army Corps of Engineers (ACOE) section 404 permit for development. Unit M3 is along the shoreline, but it is unlikely that development will require a shoreline alteration permit from the ACOE due to the existing protections provided by the SMA. Finally, PIA (the only developer with publicly available plans for homes in critical habitat) indicates it has no plans to obtain Federal permits or Federal funding (PIA, 2002).

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement.*

Potential Entities Impacted: None

3.c. Industrial, Commercial, and Other Urban Development

3.c.(1) Keahuolu Project

The Queen Lili‘uokalani Trust (QLT) is planning to build a future “downtown” for Kailua-Kona, which is the largest city on the west side of the Big Island. This land is in the Keahuolu *ahupua‘a*, so it is known as the Keahuolu Project. Phases I and II of the Keahuolu Project will cover 456 acres of QLT land *mauka*[12] of the Queen Ka‘ahumanu Highway. Approximately 344 acres (75 percent) of Phases I and II are included in Unit Y2.

The QLT was created in 1909 by the late Queen Lili‘uokalani, Hawai‘i’s last reigning monarch, to provide care for orphans and destitute children, with a preference given to children of Native Hawaiian ancestry. Since 1917, the QLT has worked with needy children (and their families and communities) through the Queen Lili‘uokalani Children’s Center (QLCC) located throughout the State. QLCC services are funded primarily by revenue generated from 6,300 acres inherited from Queen Lili‘uokalani. A significant percentage of the future QLT funds are expected to be generated by the Keahuolu Project (John M. Knox & Associates, Inc, 2002).

The planned development in the portions of Phases I and II of the Keahuolu Project that are included in critical habitat include a regional shopping center, several retail commercial areas, financial plaza, professional plaza, several office areas, a business hotel, a civic and cultural center, open space, and several interior roads (John M. Knox & Associates, Inc, 2002).

The project is in the Urban District, is proposed for “High-Density Urban” in the 2001 draft county general plan (it is currently designated as “Urban Expansion” by the county), and most of the project is zoned for commercial use by the county (the remainder is expected to be zoned commercial in the near future). A portion of Phase I, the Makalapua Shopping Center, is already complete (John M. Knox & Associates, Inc, 2002). As such, continued development of Phases I and II are anticipated throughout the next 10 years.

Potential Project or Activity, next 10 years: Keahuolu Project urban expansion

Federal Involvement: None

There is no known *Federal involvement* for the urban expansion projects.

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement* for urban development. However, potential indirect economic and social impacts of the designation of critical habitat on the Keahuolu Project are discussed in Section 4.

Potential Entities Impacted: None

[12] Inland, toward the mountains.

3.c.(2) Kohanaiki Business Park Expansion

The Kohanaiki Business Park consists of 25 one- to two-acre improved lots *mauka* of the Queen Ka‘ahumanu Highway. Portions or all of 21 of these lots are in Unit Y1; however, as mentioned in Chapter I, these graded lots will be removed by revising the critical habitat boundaries in the final rule because they do not contain the *primary constituent elements.*

Unit Y1 also includes 23 acres of a 40-acre parcel *mauka* of the existing Kohanaiki Business Park. This parcel is currently undeveloped, but according to an Environmental Impact Statement (EIS) prepared in 1991 for this project, it will be subdivided, graded, and sold in a similar manner as the existing Kohanaiki Business Park.

Potential Project or Activity, next 10 years: Kohanaiki Business Park expansion

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement*.

Potential Entities Impacted: None

3.c.(3) Kaloko Industrial Park Expansion

The Kaloko Light Industrial and Commercial Park lies directly *makai*[13] of the proposed Unit Y1. The existing development contains 85 lots within 103 acres, and is the first two phases of the planned development. The third and fourth phases will add 82 additional lots on a 102-acre parcel. Approximately 85 acres (83 percent) of this expansion parcel is in the critical habitat for the listed plants.

The developer, TSA International, Ltd. (TSA), has completed a final Environmental Impact Statement (EIS) for the Kaloko Industrial Park expansion. The site was recently redistricted from the Conservation District to the Urban District by the State Land Use Commission (LUC). The only major development approval currently pending is a zoning permit from the county. Since the area is designated for industrial use in the 2001 *County of General Plan Revision*, TSA is likely to receive a zoning permit. There is no known *Federal involvement* at this time.

Development on the site will involve grading all 102 acres, constructing roads, installing utilities, and selling the vacant lots for light industrial and commercial uses.

Potential Project or Activity, next 10 years: Kaloko Industrial Park expansion

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

[13] Towards the ocean

No consultations or project modifications are anticipated because there is no *Federal involvement*.

Potential Entities Impacted: None

3.d. Farming and Ranching Operations

As noted above, the proposed critical habitat includes approximately 69,518 acres in the Agricultural District, in all of the units except A2, C, M5, X, and BB (see Table I-1). Much of the land in the Agricultural District in critical habitat is, from the perspective of agriculture, "junk" land that is unsuitable for farming or ranching. This land includes gulches, steep hillsides, rocky land and relatively recent lava flows having little or no topsoil. Almost all of higher quality agricultural land in critical habitat is used for grazing (discussed in this section) and forestry (discussed below in Section 3.e.) A few of the proposed critical habitat units may also have areas suitable for small scale diversified farming, but most of the soils are too rocky or dry to support commercial crops.

In 1977, the State Department of Agriculture identified the *Agricultural Land of Importance to the State of Hawai'i* (ALISH). The ALISH study defines important agricultural lands as either prime, unique, or other important agricultural land, based on slope, soils, and water supply. According to this study, the Big Island contains 114,700 acres of prime, 1,700 acres of unique, and 436,800 acres of other important agricultural land, or a total of 553,200 acres of important agricultural land. The proposed critical habitat contains 2,100 acres of prime, zero acres of unique, and 34,800 acres of other important agricultural land, or a total of 36,900 acres of important agricultural land (6.6 percent of the Big Island total). Almost all the prime agricultural land is in Unit B, while most of the other important agricultural land is in Units AA, B, E, F, G, K, N2, Q, W, and Z.

Activities in critical habitat associated with farming and ranching that could affect the plants typically include maintaining water systems and fences. The majority of these farming and ranching operations do not have *Federal involvement* and will not be directly impacted by the implementation of section 7 of the Act for the plants.

Nevertheless, some farmers and ranchers may participate in farm loan, disaster relief, or conservation programs sponsored by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and the Farm Services Agency (FSA). USDA farm loan programs are discussed in this section. USDA disaster relief programs are discussed later in the section on Natural Disasters (Section 3.q.), and USDA conservation programs are discussed later in the section on Conservation Activities (Section 3.e.(2)).

The FSA offers direct and guaranteed loans to farmers and ranchers who are temporarily unable to obtain private, commercial credit. Under the guaranteed loan program, FSA guarantees loans made by conventional agricultural lenders for up to 95 percent of the principal loan amount. The FSA also offers a direct loan program.

The two main types of loans available under both the guaranteed-loan and direct loan programs are Farm Ownership loans and Farm Operating loans:

— Farm Ownership Loans may be used to purchase farmland, construct or repair buildings and other fixtures, develop farmland to promote soil and

water conservation, or refinance debt. In order to qualify for this loan or loan guarantee, the farmer or rancher must own the farmland.

— Farm Operating Loans may be used to purchase livestock, farm equipment, feed, seed, fuel, farm chemicals, insurance, and other operating expenses; fund minor improvements to buildings; fund water development and family subsistence; and refinance debts. The farmer or rancher need not own the land.

Historically, FSA has provided farm loans and loan guarantees to an average of eight borrowers per year on the Big Island (FSA, 2002). If this continues, then approximately 80 additional borrowers on the Big Island (8 * 10) will receive FSA loans or loan guarantees over the next 10 years.

The farmers and ranchers who receive FSA loans each year are likely to be spread throughout the 553,200 acres of important agricultural land on the Big Island. As such, there will be an average one farmer or rancher who receives a FSA loan for every 6,915 acres of important agricultural land over the next 10 years (553,200 / 80). The proposed critical habitat contains 36,900 acres of important agricultural land, so there will be approximately five (36,900 / 6,915) farmers or ranchers in critical habitat who receive a FSA loan over the next 10 years.

Potential Project or Activity, next 10 years: FSA Farm loans and loan guarantees

Federal Involvement: FSA funding or oversight

Consultations and Costs

FSA indicates that for direct loans, individual farmers and ranchers will be included in the section 7 consultation process and, for loan guarantees, the lending agency will be included in the consultation.

C Total Section 7 Costs: $48,500 to $103,000

Estimate is based on the following: (1) five FSA Farm Operating loans or loan guarantees over the next 10 years; (2) Low to Medium cost (from Table VI-1) of a consultation with a Federal agency as the Applicant and the involvement of a non-Federal entity; and (3) five biological surveys of 100 acre open sites with easy to medium access.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

FSA Farm Operating loans and loan guarantees in critical habitat will be used by either farmers or ranchers. In general, grazing in critical habitat will occur in areas that have been previously been grazed. Any listed plants or the *primary constituent elements* in these areas are likely to be inaccessible to the cattle due to fences, lava flows, gulches, steep cliffs or hills. As long as these barriers are not removed or altered, grazing can continue in critical habitat. There are no known plans to open up new areas to grazing or to alter the existing barriers in critical habitat, so continued grazing is not likely to adversely affect the listed plants or critical habitat. As such, if all

future loans and loan guarantees in critical habitat are used to support ranching, no project modifications are anticipated.

On the other hand, potential project modifications for farmers include avoiding existing stands of listed plants. However, most of the land in agricultural use within the proposed critical habitat is used for grazing rather than farming purposes, so there are few potential farmers to be impacted. Given the limited number of farmers involved in diversified agriculture and the limited area involved, the project modifications costs related to farming activities, should a farmer receive financing from FSA, would be minimal.

Potential Entities Impacted:

Federal: Service, FSA
Private: Individual farmers and ranchers

3.e. Forestry

Public and private entities on the Big Island are using its central Pacific location, excellent growing climate, and the availability of former sugar lands to develop its forestry sector. A 1981 State DOFAW study identified approximately 80,000 acres statewide of former sugarcane land as ideal for the establishment of a forest plantation. An additional 100,000 acres of pasture and brush lands were identified for longer-rotation forest plantations. The study concluded that there are ample lands available on the Big Island to establish a forest plantation industry (Draft Hawai'i County General Plan, 2001).

The Big Island's forest sector is expanding. Approximately 24,000 acres are now being cultivated in the Hamakua area for eucalyptus production, with thousands of additional acres being planned. Many landowners on the Big Island are currently involved with the commercial production of forest products, both eucalyptus and higher value hardwoods such as koa, toon, and maple. Currently, koa harvesting, which mainly occurs in the South Kona area, is on the decline. (Draft Hawai'i County General Plan, 2001).

Portions of the proposed critical habitat are used for forestry. For example, harvesting is currently occurring on Unit V on areas owned by Kamehameha Schools and Kealakekua Development Corporation. In addition, there are many small scale harvesting operations of koa and *'ohia* on private land, some of which may be in proposed critical habitat. However, the new emphasis in forestry is on growing koa, rather than harvesting naturally occurring koa. Many ranchers are planting ranch land with koa as a profitable alternative use for their property. Large areas are being converted in this manner, but can only be harvested in 20 years. One of the major funding sources for forestry ventures is the insurance sector. Major insurance companies look upon forestry as a long-term investment and they provide a solid investment base for the industry.

DOFAW has also been developing tree plantations on state forest reserve land and along highways. The State is not involved in any native harvesting. According the DOFAW, no state tree plantations are located in proposed critical habitat. Since the State is aware of the proposed critical habitat boundaries and wish to support the goals of critical habitat, they do not intend to expand state plantations into designated critical habitat areas. Instead, since they plan to eventually harvest these trees, they are focusing on land that is accessible and where harvesting would not harm the environment. As such, it is assumed that all current and future forestry activities in critical habitat are or will be conducted by private landowners. These private landowners either fund their own

investments or have private investment sources due to the potential profitability of this sector and, therefore, are unlikely to use any Federal funding.

Potential Project or Activity, Next 10 Years: Primarily planting of koa and other valuable hardwoods, some harvesting of koa and shorter yield timber.

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because this activity does not have *Federal involvement*.

Potential Entities Impacted: None

3.f. Military Activities

The Pohakuloa Training Area (PTA) is the only major military installation on the Big Island. Part of the U.S. Army Garrison, Hawai'i, PTA is the largest training area in the Pacific Theater. The training area is used by all the Services in the Department of Defense, as well as by Allied forces. The mission of PTA is to provide military units (up to brigade size) with a properly functioning combined arms training facility. PTA consists of about 109,000 acres, is more than 6,000 feet above sea level, and possesses a C-130-capable hardened airfield, 19 ranges, 24 mortar points, unlimited artillery firing positions, a 51,000-acre impact area, and access to a deep-water harbor. The ranges and firing points at PTA accommodate employment (at maximum stand-off ranges) of all the conventional weapons in the Pacific region.

PTA has a harsh as well as sensitive environment and is known for its extensive and rugged lava fields. PTA also has the highest concentration of endangered species of any Army installation in the world.

Approximately 53,800 acres of PTA are included within the Unit AA. None of the 51,000-acre impact area is included in the proposed critical habitat. As such, critical habitat covers almost 93 percent of the existing area available for maneuvers and special uses (58,000 acres). Proposed critical habitat does not include the cantonment area (which includes most of the buildings and fuel tanks in PTA), the Bradshaw Army Airfield, and the ammunition holding facility. Proposed critical habitat also excludes a portion of the eastern section of PTA (including training areas 1, 2, and portions of 3, 4, and 21). However, most of this area is included in critical habitat for the *palila*, an endangered forest bird.

Most of the information in this section comes from historical section 7 consultation files, meetings with Army personnel, the Army's *Pohakuloa Training Area Integrated Natural Resources Management Plan, 2002-2006 and Environmental Assessment*, and the publications on the Army's transformation website.

3.f.(1) Current Activities

Training activities on PTA are generally either month-long exercises by Army or Marine Corps battalions, or weekend or three-week exercises by Army Reserve and Hawai'i Army National Guard units. The four types of major training activities that potentially impact critical habitat are

maneuver exercises, bivouac, weapons live-fire, and aviation training. A brief description as well as the potential adverse impacts of these activities are summarized below:

— Maneuver Exercises Training: Maneuver is the means that a tactical force uses to detect, then close on and defeat an enemy force. At PTA, current maneuver training involves traveling in vehicles on roads, walking in formation on roads, walking overland, setting up temporary defensive positions by digging with hand tools or mechanical tools. Vehicle maneuvers are generally restricted to existing roads and trails, although some unauthorized off-road travel does occur. Studies on the impacts of dust from vehicle travel on native plants are currently being conducted. Foot maneuvers generally have little adverse effect on the environment beyond the potential introduction of non-native plants and animals. Soil disturbance can occur from digging temporary defensive positions.

— Bivouac Training: Bivouac is a term used to describe military units when they set up camp for rest, re-supply/refit, maintenance, etc. Depending on unit size, bivouac sites can contain tents, a minor vehicle/weapons maintenance area, vehicle parking area, general supply area, munitions supply area, medical area, helicopter landing zones, etc. The environmental impacts of bivouac activities tend to be concentrated and localized and include soil compaction and potential introduction of non-native plants and animals.

— Weapons Live-Fire Training: Live-fire training normally entails an individual gunner, the crew of a weapons system, or a collective unit firing at a predetermined target from firing positions on a designed range facility. PTA provides ranges for training with combat pistols, rifles, hand grenades, grenade launchers, small arms, machine guns, snipers rifles, anti-armor weapons, anti-tank weapons, field artillery, and mortal weapons. Live-fire training impacts are concentrated in existing fixed ranges, where impacts such as vegetation loss, disturbance, and erosion are largely confined on target and impact areas. However, live-fire training can sometimes spark wildfires that travel outside of the impact areas. Fire directly destroys native plants, which are not well adapted to fire, and facilitates the spread of non-native plants, which are adapted to fire.

— Aviation Training: Most aviation training activities at PTA do not affect the proposed critical habitat. However, helicopters are used in maneuver training to pick up and transport personnel and in aerial gunnery exercises. Environmental impacts include localized soil disturbance and erosion (e.g., rotor wash) in the vicinity of landing zones and firing points. The impacts of live-fire training from planes and helicopters are similar to the impacts listed above.

The non-military related activities that occur on PTA include State-managed hunting and limited outdoor recreation. State managed hunting units are discussed in Section 3.a. above.

3.f.(2) Future Activities

Many of the current activities at PTA are expected continue in a similar manner over the next 10 years, with the exception of the activities associated with "Transformation." The Army defines Transformation as creating an Army to meet the defense challenges of the future, while maintaining a trained and ready force to meet today's commitments. As part of Transformation, the Army has proposed to transform the 25th Infantry Division (Light) at Schofield Barracks into one of several nationwide Interim Brigade Combat Teams (IBCT). However, the selection is conditional on the successful outcome of an Army Programmatic Environmental Impact Statement (PEIS).

Converting the 2nd Brigade, 25th Infantry Division (Light) would result in force structure and facility changes that may have the potential to impact various Army installations and training lands in Hawai'i. Transformation would add 480 soldiers and 400 new light wheeled vehicles (called Stryker vehicles) to the Division. The specific transformation projects and activities in the proposed critical habitat on the Big Island include:

— Construction of a Battle Area Complex (BAX): This new range will be designed for live-fire, maneuver gunnery training and qualification requirements of the weapons systems of the IBCT. The primary features of the range would include course trails, stationary and moving targets, bunkers, landing zones, vehicle firing positions, trench complexes, tank trails, and service roads. The BAX would be sited along Lava Road approximately half a mile south of Bradshaw airfield. The proposed range would be oriented to the south towards the pre-existing impact area and built over current Range 11. Constructing and operating the range could affect native plants and other natural resources.

— Construction of Anti-armor Live Fire & Tracking Range (AALFT): This new range will include tracking roads, service roads, course trails, stationary and moving armor targets, and support buildings and roads. The AALFT would be sited on existing Range 8 halfway between Lava Road and the Hilo-Kona Road on the east side of PTA. The proposed range would be oriented to the west towards the pre-existing impact area. Constructing and operating the range could affect native plants and other natural resources.

— Utilities and Service Roads: The BAX and AALFT will require the installation of new utility lines from the Cantonment area to the ranges. In some cases, these lines will be placed above ground or on the ground. However, due to long-term ultraviolet damage cause by the high altitude, some of the lines will be installed underground. This will involve trenching that may affect native plants and other natural resources. The AALFT will also require an upgrade to the existing access road.

— Tactical Vehicle Wash: This new facility will be designed to accommodate the new Stryker vehicles. The wastewater from the high-pressure wash system would be treated and recycled. The vehicle wash will be located just south of the existing Cantonment and the Saddle road in Unit AA. Constructing and operating the facility could affect native plants and other natural resources.

— Keamuku Property Purchase: The Army plans to expand use of approximately 22,700 acres of additional pasture land to the north-northwest of PTA. Expansion may be accomplished through rental agreement, lease, or purchase. The proposed use of this land would be for brigade task force maneuver training area, vehicle maneuver training and a paratrooper drop zone. The Army has leased the property on an interim basis for military training in the past. Most of the Keamuku property is outside of critical habitat, although it does include approximately 940 acres of Unit AA, 90 acres of Unit D6, and 20 acres of Unit D8. Listed plant populations and areas that contain the *primary constituent elements* on this site are discrete and can be avoided during training.

— Off-road Vehicle Use: As noted above, vehicle use is currently limited to existing roads at PTA. However, the new IBCT will require the use of the Stryker vehicles for both on and off-road maneuvers. The off-road range of the wheeled vehicles will be limited by the rugged terrain at PTA, but most of the northern corridor of PTA and the Keamuku property will be accessible to the vehicles. Off-road vehicle use could result in the destruction of listed plants and general habitat fragmentation.

The Army is currently in the process of drafting the PEIS for transformation. If the Record of Decision for the PEIS is signed (i.e., the PEIS is accepted), the Army plans to complete the transformation construction projects and begin training by 2007.

Potential Projects or Activities, Next 10 Years: Maneuver exercises, bivouac, weapons live-fire, and aviation training, constructing two ranges, installing utility lines, upgrading existing roads, constructing a tactical vehicle wash, expanding use of Keamuku property, and off-road vehicle use.

Federal Involvement: Army ownership or use of land and facilities; U.S. Marine Corps, U.S. Navy, U.S. Air Force use of the land; military and other Federal funding of projects and activities.

Other Critical Habitat/Listed Species: Approximately 1,650 acres of the northeast portion of PTA and Unit AA overlaps with *palila* critical habitat. Five endangered birds and the endangered Hawaiian hoary bat are also found on PTA.

Other Land Management: Integrated Natural Resources Management Plan (INRMP)

As discussed in Chapter IV, the Army has developed an INRMP for PMRF. Its purpose is to integrate the mission of each military area with stewardship of the natural resources, including any listed species found in the area.

Consultations and Cost

The Army is currently in the process of conducting a programmatic section 7 consultation on current activities with the Service. This consultation is relying on recent biological survey results. The Army is also planning to conduct a programmatic consultation on all of the projects and activities associated with Transformation. This consultation will require biological surveys of the entire area in critical habitat. It is anticipated that another programmatic consultation will occur in the next 10 years. A biological survey will also be required for this consultation.

Since these programmatic consultations will cover large areas (greater than 50,000 acres), many different types of projects, and involve many listed species, the costs are expected to be high. Critical habitat may increase the level of effort because it includes areas that the Army believes are heavily degraded and would not have been consulted on without critical habitat. As such, each consultation is expected to involve twice the High cost from Table VI-1 of a consultation with a Federal agency as the applicant, or $41,400 (2 * $20,700).

C Total Section 7 Cost: $3,933,200 to $5,052,300

The estimate is based on: (1) three programmatic section 7 consultations in the next 10 years; (2) twice the High cost from Table VI-1 of a consultation with a Federal agency as the Applicant (3 * $41,400); and (3) two biological surveys of the 53,800 open acres of critical habitat with moderate to difficult access (2 * (53,800/500) * $17,700; 2 * (53,800/500) * $22,900). All the consultation costs are conservatively assigned to the plants, even though the consultation may also address listed wildlife species that may be present.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: $30.7 million to $41.1 million

As part of the development of the INRMP for PTA finalized in 2001, the Army identified a series of ecosystem management projects that it anticipates will result from the current programmatic section 7 consultation with the Service. Most of these projects are designated with a funding class of "Other Environmental" or "Class 3." These projects are needed to address overall environmental goals and objectives at PTA, but they are only implemented when funding becomes available. If these projects are included in the biological opinion of the section 7 consultation, their funding class will become "Must Fund", "Class 1," or "Class 2." Projects with this funding class will be funded and completed by established deadlines. Without a section 7 consultation, these projects would remain "Class 3" and may not be funded or completed in the next 10 years. As such, it is conservatively assumed that all of the costs associated with these projects are attributable to section 7 and not the baseline protections described in Chapter IV.

Current Activities

The ecosystem management project modifications the Army anticipates may result from the current section 7 consultation include management of rare plant and animals, and the management of threats from human land use, invasive plants, feral ungulates, and other non-native species. The Army also anticipates certain conservation education and outreach activities will be included in the biological opinion. The 2001 INRMP estimates these projects will costs approximately $2 million per year, although it also indicates that these costs could go up depending on the outcome of the current section 7 consultation. The Army estimates that the costs to implement the minimization/conservation measures in the most recent draft of the biological assessment will range from $2 million to $3 million per year.

Since the proposed critical habitat includes degraded areas in the northern corridor of PTA, the Army may face additional costs beyond those mentioned above. Specifically, as a result of a section 7 consultation, the Army may relocate several isolated populations of endangered plants in this area to the fenced Kipuka ʻAlala area in the southwestern portion of PTA and other locations outside of PTA. This will involve and initial cost of roughly $400,000 to $800,000, as well as an annual maintenance cost of $30,000.

Future Activities

As noted above, transformation will involve projects and activities that are not included in the current section 7 consultation. As such, a consultation on transformation may involve additional project modification costs. The Army estimates that the cost of implementing the minimization/conservation measures (e.g. project modifications) in the most recent draft of the biological assessment for the planned consultation on transformation will cost roughly $1 million year.

Critical habitat may affect the cost of the project modifications. For example, if vehicles are able to maneuver in areas where there are no listed species but are included in critical habitat, then there are not likely to be additional costs associated with critical habitat. However, if the Service states that vehicles can not maneuver in critical habitat, regardless of the presence of listed species, the Army may not continue to train at PTA.

The Service indicates that only areas that contain the *primary constituent elements* in critical habitat are subject to section 7 consultation. It is beyond the scope of this analysis to determine if the specific areas planned for future transformation vehicle maneuvers contain the *primary constituent elements*. However, even if they do, based on previous consultations at PTA regarding the *palila* critical habitat, it is unlikely that the Service will restrict all access to these areas. Instead, a section 7 consultation may result in restrictions on certain types of maneuvers or require the vehicles travel on specific paths.

Restrictions on training activities could result in lower quality training exercises or delay the final combat readiness of the IBCT. Training conducted at PTA is essential to maintain specific proficiencies that are critical to wartime performance. The skills learned at PTA are critical to the servicemen's ability to respond quickly and accurately to enemy fire and in offensive operations. Without these vital skills, the lives of the servicemen are at risk and national security is diminished. While these impacts are not readily quantifiable, they would be significant.

Summary

The total section 7 project modification costs include $2 million to $3 million per year regarding current operations, and $1 million per year for transformation. An additional one time cost of $400,000 to $800,000 plus and annual cost of $30,000 is attributable to critical habitat. As such, the total section 7 project modification costs range from $30.7 million to $41.1 million over 10 years. Additional impacts include a potential reduction in national security as a result of possible training limitations.

Potential Entities Impacted:

Federal: Service, Army, Navy, Marines, Air Force
State: Hawai‘i National Guard

3.g. National Parks and Wildlife Refuges

3.g.(1) Hawai‘i Volcanoes National Park

Hawai‘i Volcanoes National Park (the Park), the only national park in the proposed critical habitat on the Big Island, encompasses 230,000 acres that range from sea level to the summit of Mauna Loa at 13,677 feet. The Park maintains habitat for various listed species including the listed plants. The National Park Service (NPS) currently has no plans for additional roads, construction of structures, or other improvements. Instead, NPS will focus on implementing ongoing conservation projects to protect and manage the lands within the Park. Its conservation projects include control of or research on non-native ungulates, rodents, invertebrates and weeds; fire control; and habitat restoration (NPS, 2002) (see Chapter IV, Section 1.f. for more details).

Potential Activity, Next 10 Years: Conservation projects, including fencing, rodent control, weed control, habitat restoration, and outplanting

Federal Involvement: NPS as the Action agency

Consultations and Costs

C Total Section 7 Cost: $3,800 to $7,600

The cost estimate is based on (1) two five-year programmatic consultations (NPS indicates that they conduct periodic programmatic consultations for all on-going and planned conservation projects); (2) Low cost from Table VI-1 of a consultation with a Federal agency as the Applicant; and (3) no survey since the Service believes that NPS biologists at the Park have the most updated information on listed species within the Park's boundaries and has been relying on information from them in the past. All of the consultation costs are conservatively assigned to the listed plants, even though the consultation may also address listed wildlife species that may be present.

Anticipated Project Modifications and Cost: Minor

The mission of NPS is to preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education and inspiration of this and future generations. The listed conservation projects are likely to be beneficial to the listed plants by preventing or reducing ungulate predation, weed invasion, and fire. Also, other conservation projects have the goal of encouraging new populations of listed plants and restoring native habitat. Therefore, project modifications, if any, are expected to be minor.

Potential Entities Impacted:

Federal: Service, NPS

3.g.(2) Hawai‘i Volcanoes National Park Expansion

The Kahuku ranch (owned by S. M. Damon Estate) may be purchased by NPS and either added on directly to the western section of the Park or be incorporated as an additional unit. The 105,000 acre ranch (95,000 acres of which are in the Conservation District) is located in the southern part of the Big Island. This proposed purchase affects all of Damon's lands in critical habitat, or

15,863 acres in Unit K, 1,066 acres in Unit P, and 14 acres in Unit S. The current project plan is to restore the native habitat on this property.

Potential Activity, Next 10 Years: Park expansion and restoration of native habitat in acquired land

Federal Involvement: NPS as the Action Agency

Consultations and Costs

C Total Section 7 Cost: $62,100

The cost estimate is based on (1) one consultation; (2) Medium cost from Table VI-1 of a consultation with a Federal agency as the Applicant; and (3) one large biological survey of forested land with medium access. All of the consultation costs are conservatively assigned to the listed plants, even though the consultation may also address listed wildlife species that may be present.

Anticipated Project Modifications and Cost: Minor

The mission of NPS is to preserve unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education and inspiration of this and future generations. The goal of the NPS for the acquired land will be to encourage new populations of listed plants and restore native habitat. Therefore, project modifications, if any, are expected to be minor.

Potential Entities Impacted:

Federal: Service, NPS

3.g.(3) Hakalau National Wildlife Refuge

The Hakalau Forest National Wildlife Refuge (Hakalau) consists of the 33,000-acre Hakalau Forest and the 5,300-acre Kona Forest. Hakalau overlaps with proposed critical habitat units by 24,036 acres located in two parts of the island. The northern part of Hakalau is located on the windward slope of Mauna Kea approximately 12 miles northwest of Hilo. This part of the refuge overlaps with 3,418 acres of Unit E and 20,618 acres of Unit F. The southern part of Hakalau is located on the leeward (western) slope of Mauna Loa between and is somewhat drier than the northern unit of the refuge. This part of the refuge overlaps with 1,529 acres of Unit U. Several endangered bird species, an endangered bat, and a number of endangered plant species exist in Hakalau. Refuge conservation projects include control of non-native ungulates; weed control; fire control; and habitat restoration (Service, 2002) (see Chapter IV, Section 1.g for more details).

Potential Activity, Next 10 Years: Conservation projects, including fencing, ungulate control, weed control, and fire management

Federal Involvement: The Service as the Action agency

Consultations and Costs

C Total Section 7 Cost: $3,800 to $11,400

The cost estimate is based on (1) one to three internal Service consultations; (2) Low cost from Table VI-1 of a consultation with a Federal agency as the Applicant; and (3) no survey since the Service believes that its refuge biologists have the most updated information on listed species within Hakalau and has been relying on information from them in the past. All of the consultation costs are conservatively assigned to the listed plants, even though the consultation may also address listed wildlife species that may be present.

Anticipated Project Modifications and Cost: Minor

The mission of the National Wildlife Refuge System is to conserve, manage, and, where appropriate, restore the fish, wildlife and plant resources and their habitats for the benefit of present and future generations (16 USC 668ddra). The listed conservation projects are likely to be beneficial to the listed plants by preventing or reducing ungulate predation, weed invasion, and fire. Also, other conservation projects have the goal of encouraging new populations of listed plants and restoring native habitat. Therefore, project modifications, if any, are expected to be minor.

Potential Entities Impacted:

Federal: Service

3.h. State Managed Areas

3.h.(1) Hapuna Beach State Recreation Area

This 62 acre recreation area is located 2.3 miles south of Kawaihae. Approximately 18 acres of the southern portion of the existing park overlaps with the northern portion of Unit C. The recreation area currently includes a landscaped beach park with beach-related activities, picnicking, and shelter lodging opportunities.

DLNR plans renovate the existing restroom facilities by installing a special septic system that will cause ground disturbance in a limited area. Other renovations to existing facilities may include paving side roads for wheelchair accessibility and building a few additional parking spaces near the recreational area (DLNR, 2002).

In May 2001, DLNR completed a Final EIS for the Hapuna Beach State Recreation Area Expansion. The EIS outlines plans to expand the park from 62 acres to 846 acres. All 94 acres of Unit C are included in the center of the expansion area. Within Unit C, DLNR plans to build a family campground with vehicular and pedestrian access, a comfort station, two fisherman's parking lots, several foot paths, and a coastal hiking trail. Additional improvements that may affect critical habitat include the installation of potable and irrigation water lines, and the realignment of the old Kawaihae-Puako roadway and utilities. The EIS indicates that the infrastructure improvements are likely to occur in the next 10 years, however, the construction of the campground may occur at some point after 2009.

As part of the EIS process, a botanical survey of the entire area included in Unit C was conducted in 1994. This survey did not locate any listed species. However, the proposed rule indicates Unit C provides occupied habitat for *Sesbania tomentosa*.

Project or Activity, Next 10 Years: Renovation of existing facilities and planned expansion of Hapuna Beach State Recreation Area

Federal Involvement: None

The 2001 EIS indicates that the portion of the expansion project *makai* of the Queen Ka'ahumanu Highway will be financed by the State's general obligation bond funds. The remaining portions may be privately funded. In addition, the EIS indicates that no Federal permits are required for the expansion and renovation project.

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because there is no *Federal involvement.*

Potential Entities Impacted: None

3.h.(2) Natural Area Reserves

A Natural Area Reserve (NAR) is based on the concept of protecting ecosystems rather than individual species, with the goal of preserving and protecting representative samples of Hawaiian biological ecosystems and geological formations (Hawai'i Revised Statutes, Sect. 195-5). Although most NARs are located in the State Conservation District, they can include land in other Districts (see Chapter IV, Section 2.d.(2) for more details).

Kipahoehoe NAR

The Kipahoehoe NAR is located within Unit S. This 5,583 acre reserve is located on a narrow section of land running down the southwest slopes of Mauna Loa and includes rare lowland grassland, dry and mesic forests, montane wet forests and lowland lava tube systems. 868 acres of the Kipahoehoe NAR overlap with Unit S and the majority of this area is currently *unoccupied* by listed species. DLNR is installing exclosure fencing to keep ungulates away from listed species. This project is mostly funded by the Service, and the State provides the balance (DLNR, 2002).

Potential Project or Activity, Next 10 Years: Installing exclosure fencing to protect listed species

Federal Involvement: Partial Federal funding by the Service

Consultations and Costs

C Total Section 7 Cost: $5,200

The cost estimate is based on (1) one consultation; (2) the Low cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no biological survey will be required, as current biological survey information should be sufficient.

Anticipated Project Modifications and Cost: None

The goal of this project is to provide protection to the listed plants. Therefore, the project will be planned to minimize impacts on the plants. As a result, project modifications are not expected.

Potential Entities Impacted:

Federal: Service
State: DLNR

Pu‘u Make‘ala NAR

The Pu‘u Make‘ala NAR is located within Unit G. Located on the gentle sloping eastern flank of Mauna Loa, this reserve contains 12,106 acres of montane wet *‘ohi‘a* and koa forests. 8,745 acres of the Pu‘u Make‘ala NAR overlap with Unit G and most of this area is currently *unoccupied* by listed species. DLNR is involved in a number of conservation activities, which include: maintaining exclosure fences to keep ungulates away from listed species; weed control; and outplanting. These activities are partially funded by the Service (DLNR, 2002).

Potential Project or Activity, Next 10 Years: Various conservation activities

Federal Involvement: Partial Federal funding by the Service

Consultations and Costs:

C Total Section 7 Cost: $5,200 to $15,600

The cost estimate is based on (1) one to three consultations; (2) the Low cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no biological survey will be required, as current biological survey information should be sufficient.

Anticipated Project Modifications and Cost: None

The goal of this project is to provide protection to the listed plants. Therefore, the project will be planned to minimize impacts on the plants and project modifications are not expected.

Potential Entities Impacted:

Federal: Service
State: DLNR

Manuka NAR

The Manuka NAR is located within Unit Q. This reserve lies on the southern tip of the island and it is the largest reserve at 25,550 acres. Extending from sea level to 5,000 feet in elevation, the Manuka NAR features a broad range of habitats. Approximately 7,765 acres of the Manuka NAR overlaps with Unit Q and the majority of this area is currently *unoccupied* by listed species.

Manuka NAR: Interpretive Trail Project

DLNR plans to develop an interpretive trail through parts of this NAR. This trail will include educational signs and displays that will provide information about the habitat and listed species. This Service is providing partial Federal funding for the project (DLNR, 2002).

Potential Project or Activity, Next 10 Years: Interpretive Trail Project

Federal Involvement: Partial Federal funding by the Service

Consultations and Costs

C Total Section 7 Cost: $19,600

The cost estimate is based on (1) one consultation; (2) Medium cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) one biological survey of a 10-acre forested site with medium access.

Anticipated Project Modifications and Cost: Minor

The goal of this project is to educate the public about native habitat and listed species. Therefore, the project will be planned to minimize impacts on the plants. However, there may need to make some small modifications made regarding the construction of the trail or informational signage. The cost of these project modifications are anticipated to be minor.

Potential Entities Impacted:

Federal: Service
State: DLNR

Manuka NAR: Exclosure Fencing

DLNR currently plans to install exclosure fencing to keep ungulates away from listed species. This project is mostly funded by the Service, and the State provides the balance (DLNR, 2002).

Potential Project or Activity, Next 10 Years: Exclosure fencing installed to protect listed species

Federal Involvement: Partial Federal funding from the Service

Consultations and Costs

C Total Section 7 Cost: $5,200

The cost estimate is based on (1) one consultation; (2) Low cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no biological survey will be required, as current biological survey information should be sufficient.

Anticipated Project Modifications and Cost: None

The goal of this project is to provide protection to the listed plants. Therefore, the project will be planned to minimize impacts on the plants. As a result, project modifications are not expected.

Potential Entities Impacted:

Federal: Service
State: DLNR

3.h.(3) State Forest Reserves

The stated purpose of the State Forest Reserves is to protect native ecosystems and important watersheds. On the Big Island, State Forest Reserves are found in Hilo, Honuaʻula, Kapapala, Kaʻu, Kohala, Malama-Ki, Manowaialeʻe, Mauna Kea, Mauna Loa, Olaʻa, Puʻu Waʻawaʻa, South Kona, and Upper Waiakea.

While State Forest Reserve projects are primarily funded by the State, limited Federal funding is provided for various fire management activities.

Potential Project or Activity, Next 10 Years: Fire management

Federal Involvement: Partial Federal funding

Consultations and Costs

C Total Section 7 Cost: $5,200 to $10,400

The cost estimate is based on (1) one to two consultations; (2) Low cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no biological survey will be required, as current biological survey information should be sufficient.

Anticipated Project Modifications and Cost: None

The goal of these activities is to provide protection to the listed plants. Therefore, the activities will be planned to minimize impacts on the plants. As a result, project modifications are not expected.

Potential Entities Impacted:

Federal: Service
State: DLNR

3.i. Roads

3.i.(1) Saddle Road Improvement and Realignment

The Saddle Road (State Route 200) is an existing road that connects the east and west sides of the Big Island. The 53-mile road crosses the center of the island in the saddle between Mauna Kea and Mauna Loa. The existing Saddle Road crosses or is directly adjacent to approximately 10 miles of Unit AA and 10 miles of Unit G.

The Saddle Road is a narrow, winding, two-lane road with steep grades, sharp curves, poor pavement, and substandard drainage. Although the road is two-directional, deterioration of the pavement has reduced much of the road to one asphalt travel lane. This encourages motorists to

drive in the center of the road, increasing the potential for head-on collisions. The road is also heavily used by the military as it is the only access road to Pohakuloa Training Area (PTA) (discussed in Section 3.f.) Military maneuvers also must cross the road, disrupting both training and motorists. For these and other safety and capacity reasons, discussion for planning the current Saddle Road Improvement and Realignment Project (Saddle Road Project) began as early as 1991.

In November 1997, FHWA initiated a formal section 7 consultation with the Service regarding the Saddle Road Project's effects on the endangered *palila* bird and its critical habitat and the threatened plant species *Silene hawaiiensis*. In October 1997, a draft environmental impact statement (DEIS) was prepared by the U.S. Department of Transportation Federal Highway Administration (FHWA). In July 1998, the Service completed a final Biological Opinion and determined that the Saddle Road Project is not likely to jeopardize the continued existence of the *palila* or *Silene hawaiiensis* and is not likely to adversely modify *palila* critical habitat. These findings were based in large part on the conservation measures built into the project by the FHWA, as described in the Biological Opinion and in the DEIS.

The DEIS splits the existing road into four sections, and proposes a series of improvement and realignments alternatives for each section. In October 1999, a Record of Decision was signed for the DEIS that chose one alternative for each section. The chosen alternatives in sections I, II and III may affect the proposed critical habitat for the plants in the following ways:

— In section I (the western portion of the Saddle Road), the chosen alternative (W-3) is a realignment to the south of the existing Saddle Road. This realignment will directly affect approximately 2.5 miles of Unit AA.

— In section II (center portion near PTA), the chosen alternative (PTA-1) is a realignment to the north of the existing Saddle Road and the Cantonment area of the PTA. This realignment will directly affect approximately 10.2 miles of Unit AA.

— In section III (eastern potion before Hilo), the chosen alternative (EX-3) involves widening and improving the existing roadway. This improvement will directly affect approximately 7.8 miles of Unit G.

The construction phase of the Saddle Road Project is planned to begin in Spring of 2003. The FHWA has recently initiated a formal section 7 conference regarding the proposed critical habitat for the plants. A section 7 conference is similar to a section 7 consultation except that it is conducted in reference to a proposed critical habitat designation instead of a final designation. During the conference, certain conservation measures in the 1998 Biological Opinion may be modified. If this is the case, the conference will also serve as a re-initiation of the completed 1998 section 7 consultation. However, the Service indicates that both conference and re-initiation will be conducted at once and will result in one formal conference report. Once critical habitat is finalized, this report will become the new Biological Opinion for the Saddle Road Project.

Potential Project or Activity, next 10 years: Saddle Road Project

Federal Involvement: FHWA and U.S. Department of the Army Military Traffic Management Command (MTMC) funding

Conference/Re-initiation and Costs:

C Total Section 7 Costs: $20,700

Estimate is based on (1) one conference/re-initiation on the Saddle Road Project (2) High cost from Table VI- 1 of a consultation with a Federal Agency as the Applicant (the conference/re-initiation process is similar to the consultation process, so the same cost estimates are used), and (3) no biological surveys because the entire area was surveyed as part of the 1998 section 7 consultation and DEIS process.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: $7.1 million to $8 million

The DEIS and the completed Biological Opinion for the Saddle Road Project identify a series of project modifications and conservation measures to reduce effects to listed plants and the endangered *palila* and its critical habitat. The project modifications can be split into four general categories: listed plant project modifications, minimization of fire hazard project modifications, alien species project modifications, and conservation set-asides. A summary description of these project modifications is provided below.

Listed Plant Project Modifications

FHWA realigned a portion of the planned right-of-way within PTA to avoid a population of *Silene hawaiiensis*. This population, another *Silene hawaiiensis* population, and a *Plantago hawaiiensis* population will be fenced with temporary construction fencing during construction. The FHWA and HDOT will coordinate with the Service when locating vehicle pull-offs along the entire length of the project. The road improvement design will be modified to maintain the Saddle Road's current distance from a population of *Cyanea platyphylla*. Signs, fencing, and roadway designs will be made to discourage motorists from entering this plant's habitat. Finally, a gate will be installed along an access road that leads to a *Clermontia peleana* individual.

Minimization of Fire Hazard Project Modifications

FHWA will construct an additional eight-foot paved shoulder along certain portions of the planned realignment to serve as a paved firebreak for the anticipated increased traffic along the road. There will be a nine-inch extruded asphalt curb at the end of the of eight-foot paved shoulder to stop cigarettes or matches thrown from cars from coming in contact with flammable vegetation. There will also be a four-strand smooth wire fence installed along the inner edge of the eight-foot shoulder to prevent unauthorized excursions into fire-prone habitat. The eight-foot shoulder and the associated curb and fence will be constructed along one side of most of the portions of the road that are directly adjacent to the critical habitat for the *palila*, and along both sides of the road for most of the portions that go directly through critical habitat.

Additional fire hazard project modifications include developing a fire management plan and installing emergency telephones every 1.2 miles for the entire length of the realigned road near PTA. The Army has also upgraded its fire-fighting capabilities.

Alien Species Project Modifications

Construction equipment and material has the potential for being the major vector for alien plant and invertebrate species dispersal during construction. All construction equipment will be steam cleaned and fumigated before being transported to the site. Every effort will be made to balance earthwork quantities so that no outside fill sources will be needed throughout the project. If outside fill is needed, it will be sterilized. Also, fill from pasture areas of the project will not be used in native-dominated areas. The right-of-way in these native-dominated areas will be inspected every four months and any alien plants species will be treated with herbicide. Once construction is complete, herbicides will be used to combat alien roadside weed and grass incursions.

Conservation Set-Asides

FHWA will provide specific additional lands in the Pu‘u Mali areas on the north slope of Mauka Kea and facilitate habitat restoration of these State lands, along with Kipuka ‘Alala in the western portion of PTA. Habitat restoration will require fencing and the removal of both domestic and feral ungulates and follow-up monitoring. Combined, these areas include approximately 9,346 acres of land. Most of these areas are not included in critical habitat for the plants; however, the 3,000 acres in Kipuka ‘Alala contain many rare plants and are included in Unit AA.

Allocation of Project Modification Costs

The 1997 DEIS estimates that the total costs for additional design features for fire prevention, *palila* critical habitat replacement lands, and construction mitigation requirements will cost $8.8 million for the sections of the project in the native-dominated areas (Sections II and III). Since the DEIS was published, the estimated project modification costs have increased. The most recent cost estimate is $12.4 million over 10 years (Rana Productions, Ltd., 2002). Approximately $5 million of this cost is for projects modifications designed to minimize effects to the *palila* and its critical habitat, while the remainder ($7.4 million) is for project modifications designed to minimize effects to both the *palila* and the listed plants. Assuming half of this cost is attributable to the *palila,* then $3.7 million ($7.4 million / 2) of the project modification costs are attributable to the listed plants. While this money has not yet been spent, the consultation was completed prior to the designation of critical habitat for the plants. As such, none of the $3.7 million are attributable to critical habitat.

Potential Costs in Conference/Re-Initiation Attributable to Plants Critical Habitat

As noted above, the project modifications identified in the 1998 Biological Opinion provide many protections for individuals or populations of listed plants. Most of these will also provide protections for the critical habitat for the listed plants. However, the eight-foot paved shoulder and associated curb and fencing are designed to protect the *palila* critical habitat from fires started along the road. Unit AA for the plants is primarily on the opposite side of the road from the *palila* critical habitat. As such, during the planned conference/re-initiation, FWHA may agree to construct the eight-foot paved shoulder along additional portions of the road to minimize the risk of fire plants critical habitat.

Within the fire prone areas of the Saddle Road Project, the new alignment is adjacent to roughly 4.3 miles of Unit AA, and passes through roughly 5.9 miles of Unit AA. However, one or both sides of these segments will already include the eight-foot shoulder in order to protect the *palila* critical habitat. Combining all of the segments would need the eight-foot shoulder to protect only

the plants critical habitat results in the equivalent of one side of approximately 10 miles of road. This equals roughly 422,400 square feet of additional pavement (10 * 5,280 * 8). Based on a review of road projects across the State, the construction of a square foot of road costs between $8 and $10 (Hawai'i County Department of Planning, 1991; Hawai'i County Department of Public Works (DPW), Hawai'i Department of Transportation, Wilson Okamoto & Associates, Rana Productions, Ltd., 2002). As such, the road construction costs would increase by $3.4 million to $4.2 million.

Additional fire protection project modifications for Unit G are not anticipated due to the wet climate in that region.

The planned alignment for the Saddle Road Project will also directly affect roughly 10.2 miles of Unit AA and 7.8 miles of Unit G. Based on the average additional right-of-way width for these sections, the project will directly affect approximately 160 acres of Unit AA and 60 acres of Unit G. As noted above, direct effects to the *palila* critical habitat were off-set by plans to establish conservation set-asides in the 1998 Biological Opinion. An additional conservation set-aside for the plants critical habitat directly affected in Unit AA is not likely because the Army has already set-aside almost 4,000 acres in Kipuka 'Alala in Unit AA and is managing the area for conservation. However, Unit G is in a different ecological zone than Unit AA, so additional conservation areas may need to be set aside.

The number of acres to set-aside to offset loses to critical habitat varies on a case by case basis. As noted above, 9,346 acres of land will be set aside to offset the loss of 103 acres of *palila* critical habitat. This indicates a ratio of land set aside to land directly affected in critical habitat of 90:1. However, there is significant uncertainty regarding how much of this mitigation is attributable solely to section 7, and how much is attributable to other baseline regulations identified in Chapter IV. For example, if the 1998 Saddle Road Project Description project description included less land to be set aside (a ratio of 10:1, 5:1, or 1:1), the Service may still have determined that project is not likely to jeopardize the continued existence of the listed species and that the project is not likely to adversely modify critical habitat in the 1998 Biological Opinion. The additional mitigation land may have been proposed to satisfy other regulations or to increase public support for the project.

There is also significant uncertainly regarding the transferability of the conservation measures designed to off-set impacts to the *palila* critical habitat in the 1998 consultation to other species critical habitat. Planning for the Saddle Project began in 1991 and construction has not yet begun due to the number of stakeholders involved, the size of the project, controversial issues, and a variety of other factors. In order to help the project along, significant Federal funding sources were made available specifically to offset impacts to *palila* critical habitat. It is not known whether these funding sources will be available for future projects and section 7 consultations. In addition, the biological needs of bird species and plant species are much different, and thus the number of acres required for conservation of the species will also be different.

Based on this information, a conservation set-aside ratio 90:1 is not indicative of the ratios that will be used in future section 7 consultations on road projects for listed plants. Instead, based on ratios typically used on the mainland and information provided by the Service, it is assumed a ratio of 2:1 to 3:1 will be used in future section 7 consultations. As such, to off-set the loss of 60 acres in Unit G, FWHA may purchase and manage 120 to 180 acres as a conservation set-aside.

Most of the land in the northern portion of Unit G is owned by the State and is in the Conservation District. Since the State Department of Transportation (HDOT) is a cooperating agency in the Saddle Road Project, it is likely that the State will donate the land for conservation.

As noted in Section 4 below, fencing and conservation management in wet high-elevation areas costs roughly $30 to $80 per acre per year, so the total costs to manage the 120-acre to 180-acre conservation set-aside over 10 years will range from $36,000 to $144,000 ($30 * 120 * 10, $80 * 180 * 10).

Summary

The projected project modification costs attributable to the listed plants are $3.7 million over the next 10 years. Additional project modifications may result from the conference/re-initiation regarding the proposed critical habitat for the plants. The cost of these additional project modifications are estimated to range from $3.4 million to $4.3 million over the next 10 years. As such, the total section 7 cost of project modifications to the Saddle Road Project attributable to the listed plants is $7.1 million to $8 million.

Potential Entities Impacted:

Federal: Service, FHWA, MTMC
State: HDOT

3.i.(2) Keahole to Keauhou (K-to-K) Region

The *Keahole to Kailua Development Plan* (1991), the draft *County of Hawai'i General Plan Revision* (2001), and the *Keahole to Keauhou Project Update* (2002) all identify three road projects that could be directly or indirectly affected by proposed critical habitat Units Y1 and Y2: constructing the Ane Keohokalole Highway (Mid-level Road), constructing Main Street (Service Road), and widening the Queen Ka'ahumanu Highway.

The Ane Keohokalole Highway, a four-lane primary arterial road with a minimum right- of-way of 120 feet, is planned to run *mauka* (inland) of and parallel to the existing Queen Ka'ahumanu Highway with a north-south orientation. The right-of-way will begin at the intersection of Henry Street and Palani Road and extend northwards through approximately 1.6 miles Unit Y2. The highway will then connect to a short existing roadway section *makai* of the Kealakehe High School. The planned right-of-way continues north through approximately 0.4 miles of the eastern corner of Unit Y1.

Main Street, a two-lane collector road with a minimum right-of-way of 80 feet, is planned to run parallel to and between the existing Queen Ka'ahumanu Highway and the planned Ane Keohokalole Highway. The right-of-way will extend north from the existing Kamanu Street in the Koloko Light Industrial Park through approximately 0.5 miles of Unit Y1.

HDOT plans to widen the existing Queen Ka'ahumanu Highway to four lanes with designated turning pockets and pedestrian walkways from the Kealakehe Parkway to Henry Street. This is a top priority for HDOT and construction is scheduled to begin in fiscal year 2003-2004. The widening will occur directly *makai* of all of Unit Y2. However, based on current setbacks, the widening will not directly affect critical habitat.

Potential Project or Activity, next 10 years: Planning and constructing the Ane Keohokaolole Highway and Main Street and widening the Queen Ka'ahumanu Highway

Federal Involvement: U.S. Federal Highways Administration (FHWA) funding

Major public road construction and improvement projects in Hawai‘i generally receive funding from the FHWA.

Consultation and Costs:

C Total Section 7 Costs: $98,600

Estimate is based on (1) three consultations for road construction (2) High cost from Table VI- 1 of a consultation with a non-Federal Agency as the Applicant and the involvement of a non-Federal agency, and (3) two biological surveys of small open sites with easy access and one survey of a medium sized open site with easy access.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: $10.7 million to $15.7 million

Based on the project modifications for the Saddle Road Project discussed above, a review of section 7 consultations for other road projects on the Big Island, and discussions with the Service, consultations on the Ane Keohokaolole Highway, Main Street, and Queen Ka‘ahumanu Highway may involve the following project modifications for the plants:

Realignment

The cost of realigning a road to avoid listed plants will depend on a series of factors, including 1) the planned alignment; 2) the extent of the realignment; 3) the surrounding landowners. An example of the costs of realignment can be found in the 1998 EIS for the extension of the Kealakehe Parkway. This road project is similar to the road projects mentioned above, but it does not directly affect critical habitat. The 1998 EIS indicates an alternative alignment of the Kealakehe Parkway preferred by the Service to avoid listed plants will cost $6 million less than the planned alignment because the alternative alignment will require less fill and excavation (FHWA, 1998). Based on this example, the cost of realigning a road to avoid a listed plant in some cases is less than the original planned alignment. However, examples of roads elsewhere in Hawai‘i such as the Saddle Road indicate that realignment to avoid listed plants can sometimes be more expensive than the planned alignment, especially if the realignment requires more fill or pavement compared to the planned alignment.

Until the right-of-ways are finalized and the areas are surveyed, there is a considerable amount of uncertainty regarding the cost of a realignment for the three road that affect proposed critical habitat Units Y1 and Y2. The current alignments of the three right-of-ways do not directly affect any known locations of listed plants except for one population in the northwestern corner of Unit Y1. In this case, the area is entirely owned by one landowner, and the biological surveys will occur early in the planning process, so the cost of realignment, if any, is expected to be minor.

Additional Eight-Foot Paved Shoulder

As with the Saddle Road Project, adding an additional eight-foot paved shoulder on the sides of the road will reduce the risk of fire in critical habitat. The Ane Keohokalole Highway will require construction of 1.6 miles of road that will pass through Unit Y2. An additional 0.3 miles of the

highway in Unit Y2 is already built. This entire 1.9 mile segment will require the additional eight-foot paved shoulder on both sides of the highway. Portions of the highway directly outside of Unit Y2 are not likely to require the additional eight-foot shoulders because the unit is bounded by the Palani Road to the South and the Kealakehe Parkway to the north. These roads will serve as fuel breaks to prevent fires started outside of Unit Y2 from encroaching on Unit Y2.

As planned, the Ane Keohokalole Highway will require construction of 0.4 miles of road that will pass through Unit Y1. The right-of-way is likely to be realigned to avoid the plant population in the northern corner of Y1. This would move the right-of-way *mauka* (east) of Unit Y1. However, since a fire started along the road outside of critical habitat could spread to critical habitat, it is assumed that approximately 1.8 miles of the *makai* (west) half of the highway near Unit Y2 will require the additional eight-foot paved shoulder.

The planned right-of-way for Main Street will cross through approximately 0.5 miles of Unit Y1. Since a fire started along the road outside of critical habitat could spread into critical habitat, it is assumed that approximately 1 mile of Main Street will require the additional eight-foot paved shoulder on both side of the street.

The widening of the Queen Ka‘ahumanu Highway will indirectly affect most of Unit Y2 through increases in traffic and the associated increase in fire risk. The existing Makalapua Shopping Center and parking lots will form an effective firebreak. As such, only the *mauka* portion of the 1.7 miles of the Queen Ka‘ahumanu widening project between the Kamakaeha Avenue and the Kealakehe Parkway will require the additional eight-foot paved shoulder.

For the three roads projects planned in or near critical habitat, approximately 2.9 miles will require the additional eight-foot paved shoulder on both sides of the road (1.9 + 1), and 3.5 miles will require the additional eight-foot paved shoulder on one side of the road (1.8 + 1.7). This equals roughly 393,000 square feet of additional pavement ((2.9 * 5,280 * 8 * 2) + (3.5 * 5,280 * 8)). Based on a review of road projects across the State, the construction of a square foot of road costs between $8 and $10 (Hawai‘i County Department of Planning, 1991; Hawai‘i County DPW, Hawai‘i Department of Transportation, Wilson Okamoto & Associates, Rana Productions, Ltd., 2002). As such, the road construction costs would increase by $3.1 million to $3.9 million.

Fire Plan

A fire plan in this area would indicate the responsible agency, point of contact in case of fire, appropriate chain of command, those responsible for extinguishing fires, the location of the listed and other biologically important species, and the duration of the plan. The fire plan is distributed to various fire stations throughout the area before construction begins. In addition, road signs are posted to alert drivers of potential fire hazards.

Since all three road projects are in the same area, one fire plan would likely be sufficient. The plan is not expected to take more than two weeks of time to prepare and distribute. Assuming $100 per hour for the applicant’s or a consultant’s time, the total cost to prepare and implement a fire plan would not exceed $10,000 (10 hours per day * $100 * 10 days).

Conservation Set-Asides

As noted in the Saddle Road Project section above, section 7 consultations on road projects that directly affect plant critical habitat could result in land being set-aside at a ratio 2:1 or 3:1. The

construction of the realigned Ane Keohokalole Highway will directly affect 1.6 miles of Unit Y2. The planned right-of-way will be 120 feet wide, plus the additional eight-foot paved shoulders on both sides of the road. This means that the project will directly affect 26.4 acres (1.6 * 5,280 * (120 + 16) / 43,560). As such, the FHWA may include set-asides of 53 acres to 79 acres as a measure to avoid adverse modification of critical habitat (26.4 *2, 26.4 *3).

Most of the remaining land in Unit Y2 is planned for development. However, the HCDCH has included plans for two large preserves as part of its VOLA master planned community (see Section 3.b.) Since the land is not suitable for development due to the presence of listed plant species, the State is likely to donate the land to an agency who will manage it, as long as the FHWA agrees to fund the management. The two preserves total roughly 38 acres. A preliminary estimate prepared by the Service indicates the cost to intensively manage these two preserves for 10 years is $5.1 million.

Additional conservation set aside land in Unit Y2 could come from the land in the Agricultural District *mauka* of the planned Ane Keohokalole Highway. This land is also planned for residential development as part of the VOLA project. Due to its proximity to the other preserves, the costs per acre to manage this preserve is likely to be similar to the costs noted above, or roughly $135,000 per acre for a period of 10 years ($5.1 million / 38). If 15 to 41 additional acres of this land is set aside for conservation, the total management cost for 10 years will be $2 million to $5.5 million.

Setting aside this 15 to 41 acres will displace the planned housing units on this land. Since most of the region is already planned for development, it is not likely these units will be built elsewhere in the next 10 years. The VOLA plans indicate the average density for this area will be seven homes per acre, so there are between 105 and 287 homes planned in the area to be set-aside for conservation. Between 63 and 172 of these homes (60 percent) will be affordable housing units. In most projects with a relatively high percentage of affordable housing units, the profits from the market-priced units typically offset the losses associated with building the affordable housing units. As such, the project is not expected to make significant profits.

However, affordable housing is viewed as a social good and an essential component of a developing community. As part of the permitting process, the Hawai‘i County Office of Housing and Community Development (OHCD) requires that each developer include a certain number of affordable housing units in their project plans. If the developer is unable to provide these units, the developer must pay $4,720 to the county for each unit not built (OHCD, 2002). Using this value as a proxy for the social value of affordable housing, the loss of 63 to 172 affordable units in the VOLA development equates to a loss of between $300,000 and $810,000 to the community.

Main Street will directly affect 0.5 miles of Unit Y1. The planned right-of-way will 80 feet wide, plus the additional eight-foot paved shoulders on both sides of the road. This means that the project will directly affect 5.8 acres (0.5 * 5,280 * (80 + 16) / 43,560). As such, the FHWA may include the set asides of 12 acres to 17 acres as a conservation measure to avoid adverse modification of critical habitat (5.8 *2, 5.8 *3).

There are approximately 69 acres of land in Unit Y1 that are not currently planned for development and are owned by the MID Corporation. The Hawai‘i County Real Property Tax Office estimates the market land value for these parcels is $10,000 per acre. However, county land assessments sometimes understate the true market value. Nearby comparable sites are currently selling for $15,000 to $20,000 per acre. As such, purchasing 12 to 17 acres of this land would cost

between $180,000 and $340,000 ($15,000 * 12; $20,000 * 17). The land could then be donated to NPS, which has expressed interest in managing the land.

If NPS is given title to the land, the county will lose property tax revenue because the U.S. Government does not pay property taxes. The current property tax rate is $4.925 for every $1,000 of assessed land value, and as mentioned above, the land is worth $180,000 to $340,000. Thus, the county would lose $8,865 to $16,745 over 10 years ($180,000 / $1,000 * $4.925 * 10 years; $340,000 / $1,000 * $4.925 * 10 years).

Since the Queen Ka'ahumanu Highway widening project will not directly affect critical habitat, a conservation set aside for this project is not anticipated.

Summary

The total project modification costs for the three road projects in the K-to-K region range from $10.7 million to $15.7 million over the next 10 years. This estimate consists of :

- Realignment Costs: Minor
- Fire Protections: $3.1 million to $3.9 million
- Fire Plan: $10,000
- Off-Site Conservation Land for Ane Keohokalole Highway: $7.1 million to $10.6 million for conservation management and a loss to community of $300,000 to $810,000 from reduction in affordable housing
- Off-Site Conservation Land for Main Street: $180,000 to $340,000 for land purchase and $8,865 to $16,745 loss in county tax revenues.
- Off-Site Conservation Land for Queen Ka'ahumanu Highway: None

Critical habitat for the Blackburn's sphinx moth (*Manduca blackburni*) is also proposed in this area. As such, a portion of the fire protections and fire plan costs may be attributable to the moth. However, as a conservative approach, all of the project modification costs are assumed to be attributable to the listed plants and the plants critical habitat.

Potential Entities Impacted:

Federal: Service, FHWA
State: HDOT
County: Hawai'i County DPW

3.j. Conservation Activities

3.j.(1) Conservation Projects Funded by the Service

The Service funds a variety of conservation and habitat restoration projects through collaboration with private landowners, community groups, conservation organizations, and other government agencies through the Conservation Protection programs as well as other programs. There are currently several conservation projects located within the proposed plants critical habitat:

- Dry Forest Restoration (Unit B): The Service is providing funding for the Queen Emma Foundation to restore dry forest habitat in the northern part of the Big Island.

— *Palila* Habitat Restoration (Unit W): The Service is providing funding in partnership with Kamehameha Schools to restore forest habitat for the *palila* bird. This project is located on the leeward slopes of Mauna Kea north of Kailua-Kona.

— Pu‘u Wa‘awa‘a (Unit Z): The Service is funding a number of projects in Pu‘u Wa‘awa‘a to address and perhaps mitigate the longstanding conflict between game mammal management and endangered species conservation. These projects, selected to benefit both game animals and endangered species, include fencing, a water reservoir repair project, a water system boundary survey, and fire control.

— Ka‘upulehu (Unit Z): This project on land owned by Kamehameha Schools under long term lease to PIA Kona Limited Partnership involves fencing, outplanting 900 endangered plants, and fire and rodent control.

Additional projects are likely in the proposed critical habitat over the next 10 years. This may involve the continuation or extension of existing projects at Pu‘u Wa‘awa‘a; the extension of past projects; or new projects within the proposed critical habitat. The number of projects that occur in the proposed critical habitat will depend upon available resources, landowner participation and the potential benefits of a project. Based on these factors and on the number of past projects, it is estimated that between three to six projects will be funded in the proposed critical habitat over the next 10 years.

Potential Projects and Activity, Next 10 Years: Conservation projects, including fencing and outplanting

Federal Involvement: Federal funding from the Service

Consultations and Costs

C Total Section 7 Cost: $11,400 to $22,800

The cost estimate is based on (1) three to six internal Service consultations; (2) Low cost from Table VI-1 of a consultation with a Federal Agency as the Applicant; and (3) no biological survey. As a general matter, internal consultations typically do not involve the applicant. No additional surveys are anticipated because of the initial information presented in the request for Service funding, technical assistance provided by the Service during the funding process, and the beneficial nature of the projects.

Anticipated Project Modifications and Cost: None

The goal of these projects is to provide protection to the listed plants. Therefore, the projects will be planned to minimize impacts on the plants. As a result, project modifications are not expected.

Potential Entities Impacted:

Federal: Service

3.j.(2) USDA Conservation Programs

Some farmers and ranchers may seek Federal funding for soil and water conservation projects from NRCS and the FSA. Programs that are applicable to the agricultural land in the proposed critical habitat are described briefly below.

— Environmental Quality Incentives Program (EQIP): The intent of this program is to address problems with soil, water, and related natural resources. Projects are most likely to be funded if they address significant statewide concerns such as animal waste management, sediment in runoff, and noxious weed control. Examples include planting a cover crop to reduce erosion, building a firebreak, and converting from a trench to a pipe fed sprinkler irrigation system.

— Wildlife Habitat Incentives Program (WHIP): The intent of this program is to restore and enhance wildlife habitat, particularly for native species. Projects are more likely to be funded if they are within critical habitat. Examples include planting native species, protecting caves, and protecting near-shore environments.

— Wetland Restoration Program (WRP): The intent of this program is to restore, enhance, and/or develop wetlands on agricultural lands.

— Conservation Reserve Program (CRP): This program allows landowners and producers who have highly erodible cropland or marginal pasture land to return the land to conservation use. Projects are most likely to be funded if they reduce erosion, improve water quality, and improve wildlife habitat. Projects typically include planting trees or grass on cropland.

As mentioned in Section 3.d., "Farming and Ranching Operations", the proposed critical habitat covers approximately seven percent of the important agricultural land on the Big Island. Thus, most of the funding will likely go to projects located outside the proposed critical habitat simply because most of the important agricultural land is outside the designation.

Over the past five years, approximately 77 farmers or ranchers received conservation funding on the Big Island. Assuming that the number of awards is evenly distributed across the important agricultural land, approximately five landowners (77 * 7 percent) in critical habitat would receive funding over the next five years. Thus, a total of 10 financed projects in critical habitat could be expected over the next 10 years (5 * 2).

The annual number of recipients may increase, however, due to increased funding and more inclusive criteria outlined in the 2002 Farm Bill (NRCS, 2002). At the same time, however, some of the landowners with land inside the proposed critical habitat who would be eligible to participate in these programs have indicated an intention to avoid participation in federally funded conservation activities to avoid a *Federal nexus* (see "Loss of Conservation Projects" in Section 4 (Indirect Costs) for full discussion). Thus, to account for both scenarios, this analysis estimates that between zero and 20 projects located in the proposed critical habitat will receive funding over the next 10 years.

These projects are not expected to adversely affect the plants or their critical habitat because they are designed to reduce pollution and runoff, manage non-native weed growth, enhance wildlife

habitats, and conserve soil and water resources. Nevertheless, NRCS intends to initiate informal section 7 consultation for each project to confirm that the Service concurs with this view.

Potential Project or Activity, next 18 years: NRCS and FSA conservation projects

Federal Involvement: Partial USDA funding

Consultations and Costs

C Total Section 7 Costs: $0 to $76,000

Estimate is based on (1) zero to 20 conservation projects, (2) Low cost (from Table VI-1) of a consultation with a Federal agency as the Applicant, and (3) no biological survey. All past biological assessments in Hawai‘i have been done by NRCS staff. Individual farmers and ranchers are notified about the consultations but are generally not directly involved in the consultation process for conservation projects (NRCS, FSA, 2002).

Anticipated Project Modifications and Costs: Minor

In general, NRCS and FSA conservation projects are designed to reduce soil erosion, conserve water, and enhance wildlife habitat. These kinds of projects benefit the plants since they improve the general ecosystem and indirectly encouraging the growth of the plants. While the Service may recommend minor changes, such as avoiding listed plant populations or having a biologist on-site when finalizing details such as fencing routes, a review of completed conservation projects across the State indicates that this type of monitoring is standard practice in biologically sensitive areas. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service, NRCS, FSA

3.j.(3) The Nature Conservancy of Hawai‘i Projects

The Nature Conservancy of Hawai‘i (TNCH) is a private, non-profit affiliate of a national organization that works with Federal, State and private partners to protect Hawai‘i’s natural areas that shelter native species. The mission of TNCH is to preserve Hawai‘i’s native plants, animals, and natural communities by protecting the lands and waters needed for their survival. TNCH is currently involved in a number of large conservation projects on the Big Island and is expected to develop several other projects in the near future. Ongoing and proposed projects include:

— Kona Hema Preserve (Unit Q): TNCH's Kona Hema Preserve is located in south Kona on the slopes of Mauna Loa. The 5,821 acre preserve protects part of an ancient *koa-‘ohi‘a* forest that spans more than 100,000 acres along the leeward coast of the Big Island. Currently, there is no public access to Kona Hema. In 1999 and 2000, TNCH acquired two adjoining parcels in South Kona to form the preserve in partnership with the U.S. Forest Service. In addition to protecting the native forests and the biological values they harbor, the chapter plans to develop a model of sustainable koa forestry that will help other landowners maintain the biological and economic value of the land.

— Ka‘u Preserve (Unit K): TNCH's Ka‘u Preserve is located near the southern end of the Big Island’s Ka‘u District, between 2,160 and 5,770 feet in elevation. The 3,548 acre Ka‘u Preserve is part of the largest and most intact expanse of native forest in the state. The preserve is primarily closed-canopy koa and *‘ohi‘a* forest, with an understory of native *uluhe* and *hapu‘u* tree ferns. Due to its rugged terrain the preserve is not open to the public. The four parcels consist of nearly pristine native forest and form a boundary between the largely intact native alpine and subalpine forest above, and the agricultural land below. TNCH will actively manage the land to prevent new weed invasions.

— S. M. Damon Estate (Units K, P, S): The entire Kahuku ranch (owned by S. M. Damon Estate) may be purchased by the National Park Service in partnership with TNCH. The 105,000 acre ranch (95,000 of which is in the conservation district) is located in the southern part of the Big Island. This proposed purchase affects all of Damon's lands in critical habitat, or 15,863 acres in Unit K, 1,066 acres in Unit P, and 14 acres in Unit S. The current project plan is to restore the native habitat on this property. The project should complement TNCH activities in TNCH’s two existing reserves, which are also located in the southern part of the Big Island.

Additional projects are likely in the proposed critical habitat over the next 10 years. This may involve the continuation or extension of existing projects; the extension of past projects; or new projects within the proposed critical habitat. The number of projects that occur in the proposed critical habitat will depend upon available resources and the potential benefits of a project. Based on these factors and on the number of past projects, it is estimated that between three to six projects will be funded in the proposed critical habitat over the next 10 years.

Potential Activity, Next 10 Years: Conservation projects, including weed control, habitat restoration, and sustainable forestry.

Federal Involvement: Federal funding from NPS and other Federal agencies

Consultations and Costs

C Total Section 7 Cost: $15,600 to $31,200

The cost estimate is based on (1) three to six consultations; (2) Low cost (from Table VI-1) of a consultation with a non-Federal Applicant, and; and (3) no biological survey. No biological survey is anticipated because previous conservation projects have not required biological surveys due to the beneficial nature of the project and the technical assistance provided by the Service and/or other Federal agencies during project development. All of the consultation costs are conservatively assigned to the plants, even though the consultation may also address listed wildlife species that may be present.

Anticipated Project Modifications and Costs: Minor

In general, TNCH conservation projects are designed to benefit the plants since they improve the general ecosystem and encourage the growth of the plants. While the Service may recommend minor changes, such as avoiding listed plant populations or having a biologist on-site when

finalizing details such as fencing routes, a review of completed conservation projects across the State indicates that this type of monitoring is standard practice in biologically sensitive areas. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service, NPS, possibly other Federal agencies
Private: TNCH

3.j.(4) Other Conservation Projects

Olaʻa-Kilauea Management Area (Unit G)

In an effort to protect native biological resources, landowners and other interested parties established a partnership to cooperatively manage the Olaʻa-Kilauea Management Area. This 32,000 acre management area includes lands owned or controlled by the Hawaiʻi Department of Public Safety (NPS) (Kulani Correctional Facility), DLNR (Puʻu Makaʻala Natural Area Reserve), NPS (Olaʻa tract of Hawaiʻi Volcanoes National Park), and privately owned lands in Kilauea Forest.

The partnership cooperative agreement signed in 1994 includes the commitment to jointly develop a natural resources management plan that includes, but is not limited to, feral animal and non-native plant control measures, collaborative research projects, and habitat protection and restoration. The overall objective of management in the project area is the protection and recovery of native ecosystems to the point that they are self-sustaining, native-dominated communities with secure populations of native plant, invertebrate, and forest bird species (See Chapter IV, 5.b).

North Kona Dry Forest Working Group (Unit Z)

Kaʻupulehu mauka is a five acre parcel in the District of North Kona, is owned by the National Tropical Botanical Garden, and is managed expressly for the benefit of endangered plants and their habitat. Currently, there are three endangered plant species that naturally occur within this parcel.

In 1996 the North Kona Dry Forest Working Group was organized to address recovery of dry forest ecosystems in the region and the group focused on this five acre parcel as its pilot project. The group has since removed all of the fountain grass and thus reduced the wildfire hazard to this area.

Kaupulehu makai is a 70 acre management unit in the District of North Kona and is part of a larger parcel owned by the Kamehameha Schools. Four endangered plant species naturally occur within this dry forest management unit. A sheep and goat fence was erected in 1999 by the North Kona Dry Forest Working as part of an effort to expand dry forest restoration efforts to larger areas within the region. The group is in the process of removing fountain grass from this site to eliminate the wildfire hazard to this area and enhance forest restoration efforts. Within both units, rodent populations are also being controlled and numerous native understory species have been planted (See Chapter IV, 5.b).

Additional projects are likely in the proposed critical habitat over the next 10 years. This may involve the continuation or extension of existing projects; the extension of past projects; or new projects within the proposed critical habitat. The number of projects that occur in the proposed

critical habitat will depend upon available resources, landowner participation and the potential benefits of a project. Based on these factors and on the number of past projects, it is estimated that between four to eight projects will be funded in the proposed critical habitat over the next 10 years.

Potential Activity, Next 10 Years: Conservation projects, including fencing, rodent control, weed control, habitat restoration, and outplanting

Federal Involvement: Federal funding and participation of Federal agencies

Consultations and Costs

C Total Section 7 Cost: $20,800 to $41,600

The cost estimate is based on (1) four to eight consultations; (2) Low cost from Table VI-1 with a non-Federal Agency as applicant; and (3) no biological survey. No biological survey is anticipated because previous conservation projects have not required biological surveys due to the beneficial nature of the project and the technical assistance provided by the Service and/or other Federal agencies during project development. All of the consultation costs are conservatively assigned to the plants, even though the consultation may also address listed wildlife species that may be present.

Anticipated Project Modifications and Costs: Minor

Future conservation projects could include fencing, replanting of native species and removal of alien vegetation. These conservation activities would benefit the listed plants since they encourage both existing listed plant populations and the growth of new listed plant populations. While the Service may recommend minor changes, such as avoiding listed plant populations or having a biologist on-site when finalizing details such as fencing routes, a review of completed conservation projects across the State indicates that this type of monitoring is standard practice in biologically sensitive areas. Thus, no major project modifications are anticipated.

Potential Entities Impacted:

Federal: Service, NPS, other Federal Agencies
State: DLNR

3.k. Water Systems

Many of the proposed critical habitat units contain both potable and non-potable water system improvements. Most of these existing improvements are designed to store or transport water in the relatively dry regions, or to transport water from the wet regions to agricultural fields. The improvements include water tanks, water catchment basins, ditches, water lines, and wells.

As mentioned in Chapter I, these existing water features are excluded from the proposed critical habitat as "unmapped holes." As such, the operation and maintenance of these manmade features and structures would not be impacted by critical habitat designation.

3.k.(1) Potable Water Systems

The existing potable water improvements in Unit Y1 along Hina Lani Street were recently upgraded and there are no plans for future upgrades (DLNR, 2002). In addition, the Hawai‘i County Department of Water Supply (DWS) indicates it has no plans for future potable water projects with *Federal involvement* that will affect the proposed critical habitat units (DWS, 2002).

Additional water system improvements may be built over the next 10 years on private land to provide water for residential development. These private projects are unlikely to have *Federal involvement.*

Potential Project or Activity, Next 10 Years: Construction of new private potable water infrastructure

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because it the construction of the private potable water systems do not have *Federal involvement.*

Potential Entities Impacted: None

3.k.(2) Non-Potable Water Systems

Portions of the Kohala Ditch, Kehena Ditch, and the Upper Hamakua Ditch are included in Units A1, A2, and B. There are no known plans to realign these ditches or to build new diversions or ditches in this area (NRCS, 2002). The *Watershed Plan and Environmental Impact Statement for the Waimea-Paauilo Watershed* (1997) indicates that a planned intake and transmission pipeline from the Upper Hamakua Ditch is downstream from proposed critical habitat Unit B.

In Unit Z, the draft Pu‘u Wa‘awa‘a management plan proposes to install new water system improvements over the next 10 years. The planned projects include:

— Installation of seven new water catchment tanks. These 10,000 gallon galvanized metal tanks will be constructed in close proximity to planned conservation units. The tanks will serve as a dip tank for helicopters and tankers responding to fire incidents, support livestock grazing along conservation unit fence lines for fine fuel control, supply water for herbicide use during weed control operations, and provide an irrigation source for newly planted seedlings of rare and endangered plants within conservation units.

— Upgrade existing waterline system. The upgrade involves replacing 20 miles of existing galvanized waterline with drisco pipe and installing nine additional miles of new drisco waterlines.

— Install water troughs. This project involves constructing 12 new water troughs to support livestock grazing and wildlife management objectives.

Additional non-potable water system improvements may be built over the next 10 years on private land in critical habitat to provide water for cattle and to irrigate native plant preserves, golf courses, and residential landscaping.

Potential Project or Activity, Next 10 Years: Construction of new non-potable water infrastructure

Federal Involvement: Possible Federal funding from the Service or NRCS for planned projects in the Pu‘u Wa‘awa‘a management area. Water system projects on private land generally do not have *Federal involvement.*

Consultation Costs:

C Total Section 7 Costs: $10,100 to $33,200

Estimate based on (1) one to two consultations in the next 10 years on water system projects in Pu‘u Wa‘awa‘a, (2) Low cost from Table VI-1 of a consultation with a Federal agency as the applicant and the involvement of a non- Federal agency, and (3) one to two biological surveys of 100-acre open or forested sites with medium access. The number of consultations is presented as a range to account for projects possible within the next 10 years, but that are not immediately planned. While other listed species may be present, the entire cost of the consultation is conservatively assigned to the plants, even though the consultation may also address the other listed species.

Anticipated Project Modification and Costs: None

The replacement of existing water lines may involve soil and vegetation disturbance. However, since one of the goals of the Pu‘u Wa‘awa‘a management plan is to preserve listed plants, it is unlikely that the replacement of existing water lines will be done in a manner that will adversely affect listed plants. As such, any project modification to avoid listed plants are attributable to the implementation of the Pu‘u Wa‘awa‘a management plan.

Potential Entities Impacted:

Federal: Service, NRCS
State: DLNR

3.l. Fire Management

Wildfires pose a significant threat to natural resources and property in the dry forest areas in Hawai‘i. The profusion of fountain grass (*Pennisetum setaceum*) and Kikuyu grass (*Pennisetum clandestinum*) increases fire loads for areas that are not regularly grazed. The danger of wildfire is especially evident in Units Z and AA, where a wildfire in 1994 burned 4,670 acres on PTA, a wildfire in 1995 burned 1,200 acres of the Pu‘u Wa‘awa‘a Forest Bird Sanctuary and another wildfire in 1999 burned 5,000 acres in the Pu‘u Wa‘awa‘a management area and 3,560 acres of PTA. These fires required $478,000 in suppression costs and caused an estimated $22.3 million in damages to natural resources in the Pu‘u Wa‘awa‘a management area alone (DOFAW, 2002).

3.l.(1) Fire Pre-Suppression

Pre-suppression activities for wildfire management on the Big Island are conducted before a fire breaks out to reduce the risk and extent of future fires. These activities are primarily conducted by the DOFAW, NPS, and the Army. The efforts of these agencies are supplemented by organizations such as the North Kona Fuels Management Group (NKFMG), and private landowners, such as Parker Ranch and Kamehameha Schools.

DOFAW is the primary responder to wildfires on most of the State owned land, Forest Reserves, and Natural Area Reserves on the Big Island. As shown in Table I-1, much of critical habitat occurs in these areas. DOFAW also conducts pre-suppression activities for wildfires throughout these areas. Current pre-suppression activities that could affect the proposed critical habitat include maintaining firebreak roads on Mauna Kea and in Pu‘u Wa‘awa‘a and performing fuel hazard reduction activities in and around enclosures for listed plants (DOFAW Fire Management Program, 2002).

DOFAW’s future pre-suppression activities are likely to be similar to current activities. Specifically, the draft Pu‘u Wa‘awa‘a management plan indicates that future fire management activities will include:

— A campaign to increase public awareness about the destructive capabilities of wildfires;

— Installing a remote area weather station that can be monitored by satellite;

— Widening firebreaks along the Mamalahoa Highway to 40 feet;

— Maintaining 12 miles of firebreaks by mechanical and chemical clearing or by promoting grazing;

— Maintaining firebreaks and reduce fuel loads within and immediately outside of fenced conservation units;

— Installing parking lots along public access roads in Pu‘u Wa‘awa‘a with non-flammable surfaces (such as pavement or gravel);

— Pursuing research for a biological control for fountain grass; and

— Creating a map to educate firefighters about biologically sensitive areas.

NPS indicates there are no plans for prescribed burns at Volcanoes National Park. The Park does maintain three existing fuel break roads by periodically scraping the grass off the surface of the unimproved road. As mentioned in Chapter I, unimproved roads are considered unmapped holes in the proposed critical habitat designation. Additional pre-suppression activities include education and closing certain roads during times of high fire danger (NPS, 2002)

Fire management on PTA is guided by the 2000 *Wildland Fire Management Plan.* The current future pre-suppression activities include establishing and maintaining a system of fuelbreaks and firebreaks to minimize the spread of fires; reducing the amount of fuels; designing the spacing of vegetation to make fire spread difficult; increasing the moisture of certain vegetation or types of

vegetation; prescribed burning to reduce volume of fuels; mechanical, manual, chemical, and/or biological (such as grazing) control of fuels; and maintaining six existing above ground dip tanks for use by ground and aviation assets during suppression and building two more (PTA INRMP, 2001).

The North Kona Fuels Management Group (NKFMG) is a regionally-based consortium of wildland fire-fighting agencies, natural resource managers, ranchers, private landowners, and other assorted interests organized to developing a long-term strategy to reduce wildfire occurrence within the North Kona and South Kohala districts of the Big Island. The NKFMG's current strategy calls for establishment and maintenance of over 50 miles of roadside firebreaks the region. Approximately eight miles of these roadside firebreaks fall in the proposed critical habitat Unit Z along the Mamalahoa Highway (NKFMG, 2002).

Additional pre-suppression activities take place on private throughout the Big Island. For example, Kamehameha Schools clears fuels within dry forest reserves in Unit Z. However, these activities are unlikely to have *Federal involvement*.

Potential Project or Activity, next 10 years: Fire pre-suppression activities

Federal Involvement: Activities carried out or funded by the Army, NPS, the Service or the U.S. Forest Service

Activities carried out or funded by the Army, NPS, or the Service have Federal involvement. In addition, DOFAW may seek funding from the Service of the U.S. Forest Service for pre-suppression activities in Pu‘u Wa‘awa‘a.

Consultation and Costs:

C Total Section 7 Costs: $9,700 to $19,400

Estimate is based on (1) one to two consultations in the next 10 years on DOFAW pre-suppression activities in Pu‘u Wa‘awa‘a; (2) Low cost from Table VI-1 of a consultation with a non-Federal Agency as the Applicant, and (3) one to two biological surveys of 100 acres of open firebreaks with easy access. Programmatic consultations for PTA will include fire management activities, so the costs are not included in this section to avoid double counting. NPS pre-suppression activities do not affect the *primary constituent elements* for the plants so they will not require a section 7 consultation.

Anticipated Project Modification and Costs: None

Wildfire is a significant threat to listed plants. Any activities that reduce the threat of wildfire will have long-term benefits to the plants. If any listed plants are identified during the survey of the firebreaks, the Service would request that the plants be avoided if possible. However, since the firebreaks are near the roads, are regularly cleared or grazed, and are dominated by non-native species, it is unlikely for the listed plants to be found in the firebreaks.

Potential Entities Impacted:

Federal: Service, U.S. Forest Service
State: DOFAW

3.l.(2) Fire Suppression

Despite pre-suppression activities, wildfires have and will continue to threaten natural resources in the proposed critical habitat units. Containing and suppressing these fires are essential to protect lives, property, and natural resources.

The primary agencies responsible for wildfire suppression on the Big Island include DOFAW, the Army, NPS, and the Hawai‘i County Fire Department (HICFD). The HICFD is primarily a structural fire department (homes, buildings), but has some wildland fire assets. Due to the limited resources of these agencies and the size of fires, one, two, three, or all four agencies may become involved suppressing wildfires. Fire suppression techniques typically include containing the fire with natural or constructed barriers and controlling the fire through coordinated efforts of airborne and ground personnel.

DOFAW, the Army, and NPS all have an objective to protect natural resources when possible. As such, efforts are already made to protect the listed plants on the Big Island from wildfires, as long as protecting these assets does not jeopardize the safety of the fire suppression personnel. In addition, these agencies all coordinate with the Service and other natural resources staff to identify the location of listed plants that need to be protected.

According to DOFAW records for the past seven years, there have been an average of eight large wildfires (greater than 100 acres) per year. Most smaller fires were quickly contained and did not require significant suppression activities. If this pattern continues, there will be roughly 80 large wildfires over the next 10 years. Based on land area and climate, it is assumed that approximately 60 of these fires (75 percent) will occur on the Big Island. Based on the percentage of the Big Island that is included in critical habitat (17 percent), approximately 10 of these fires will affect areas in critical habitat over the next 10 years. However, some of these fires may be very large and have a higher probability of affecting areas in critical habitat, so a range of 10 to 20 fires is assumed.

Potential Project or Activity, next 10 years: Fire suppression activities

Federal Involvement: Activities carried out or funded by the Army and NPS

Since suppression activities for large fires typically involve more than one agency on the Big Island, the Army and the NPS may help to suppress fires outside of Volcanoes National Park and PTA. As such, all fire suppression activities for large fires (greater than 100 acres) may have *Federal involvement.*

Consultation and Costs

Since timing is critical is suppressing a wildfire, typical section 7 consultations on fire suppression activities in critical habitat are not anticipated. However, the fire suppression agencies may notify the Service, and Service biologists are likely to become involved in the suppression planning and coordination. After the fire is contained and controlled, the agencies may meet with the Service to debrief and plan for the next fire. These activities are assumed to require the same amount of time and effort as Low or Medium consultations in Table VI-1.

- Total Section 7 Costs: $52,000 to $314,000

Estimate is based on (1) 10 to 20 consultations in the next 10 years; (2) Low to Medium cost from Table VI- 1 of a consultation with a non-Federal Agency as the Applicant, and (3) no biological surveys due to time constraints.

Anticipated Project Modification and Costs: None

Wildfire is a significant threat to listed plants. Any activities that reduce the spread of wildfire will benefit the plants. In addition, as mentioned above, the agencies that suppress fires all have an objective to preserve natural resources, including listed plants. As such, any modifications to protect listed plants and critical habitat are attributable to the baseline objectives of the fire suppression agencies.

Potential Entities Impacted:

Federal: Service, Army, NPS
State: DOFAW

3.m. Communications Facilities

The proposed critical habitat contains communications facilities in Unit G and Z. Other critical habitat units are likely to contain communication towers as well, but information on the location of private communication facilities is not readily available. The facilities in Unit Z include: two radio towers owned by Verizon Hawai‘i, Inc (Verizon); a radio tower owned by Kamehameha Schools but operated by Verizon; and a radio tower owned by Hawaiian Electric Light Company, Inc (HELCO). The facilities in Unit G include: a radio tower owned by Kamehameha Schools but operated by Verizon; and another radio tower owned by Kamehameha Schools but operated by Chronicle Publishing Company. Operation and maintenance of these existing man-made features and structures are not subject to section 7 consultation. However, planned modifications and additions to the communications facilities in the critical habitat would be subject to consultation.

In 2001, the FCC completed a series of informal consultations on proposed communications antennae sites across the State. In general, these proposed sites were in urban areas. None of the proposed sites are in the proposed critical habitat. All of the consultations concerned listed birds; the listed plants not affected.

While the most recent FCC permits have been issued for antennae sites near the urban areas outside the proposed critical habitat, new facilities could be proposed for areas near the existing facilities or elsewhere in the proposed critical habitat. It is conservatively estimated that the number of communication facilities in critical habitat will increase by 50 to 100 percent (three to six) over the next 10 years.

Potential Project or Activity, Next 10 Years: Permitting of three to six new communications facilities

Federal Involvement: FCC and/or FAA permits

Permits are required from the Federal Aviation Administration (FAA) to ensure that communications facilities will not interfere with aircraft, and from the Federal Communications Commission (FCC) to operate the facility

Consultation Costs

C Total Section 7 Costs: $13,700 to $27,300

Estimate based on (1) three to six consultations in the next 10 years, (2) Low cost from Table VI-1 of a consultation with a non-Federal agency as the applicant, and (3) three to six biological surveys, based on 10-acre sites with medium access. The Service indicates that listed birds are the primary species affected by communication facilities. As such, half the cost of the consultation is assigned to the plants, and half the cost is assigned to the listed birds.

Anticipated Project Modification and Costs:

C Total Section 7 Costs: $0 to $600,000

Due to the small footprints of communications facilities, it is likely that the facility will not adversely affect listed plant species. However, if a listed plant population or the *primary constituent elements* are found, the project may have to be modified. One modification would be to move the site far enough away from the plant population so that construction will not affect it. If the siting change is made early in the permit process, then the cost of moving the site could be negligible. However, if the siting change is made after some or all of the permits have been obtained, new permits may be required for the changed location. The cost of obtaining a Conservation District Use Permit can be between $25,000 and $100,000 (based on information from planning consultants). Therefore, the total worst-case scenario cost for up to six projects could reach $600,000. While some of the existing communications facilities are not located in the Conservation District, this analysis conservatively accounts for the possibility that the future communications facilities may be proposed within the Conservation District.

Potential Entities Impacted:

Federal: Service, FCC, FAA
Private: Verizon, Kamehameha Schools, HELCO, Chronicle Publishing Company

3.n. Golf Courses

Proposed Unit Y1 contains 102 acres of a site planned for a golf course. This site is currently in the Urban district and is located in the northeast corner of Unit Y1. There is no known *Federal involvement* for this golf course construction project.

Proposed Unit Y2 contains approximately 153 acres (79 percent) of a 194-acre planned municipal golf course site. The golf course is part of the VOLA master-planned residential project mentioned earlier in Section 3.b. The site for the golf course was conveyed by the State HCDCH to the County of Hawai‘i by Executive Order No. 3665 dated July 18, 1995 (HCDCH, 1999).

After the VOLA golf course is built, the Hawai‘i County Department of Public Works (DPW) plans to use treated wastewater from the Kealakehe Wastewater Treatment Plant to irrigate the course. This would allow the County of Hawai‘i to dispose of treated wastewater and provides a low cost source of irrigation water for the golf course. However, the county must upgrade their wastewater treatment plant before they can use the effluent for irrigation. The county plans to seek EPA funds to upgrade the treatment plant.

Potential Project or Activity, next 10 years: Golf course construction and irrigation

Federal Involvement: EPA funding

The golf course construction projects are not expected to have *Federal involvement*. However, plans to upgrade the existing wastewater treatment plant and to use the water to irrigate the golf course in Unit Y2 may use EPA funding.

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because the construction of the golf course does not have *Federal involvement.* Once the golf course is complete, the area will not have the *primary constituent element* for the plants, so wastewater spreading on the completed golf course will not require a section 7 consultation.

Potential Entities Impacted: None

3.o. State Trails and Access System

The Na Ala Hele Trail and Access System maintains existing trails within the proposed critical habitat:

— Unit A1: Pololu Trail
— Unit E: Kaluakauka Trail
— Unit F: Humu‘ula Trail
— Unit G: Pu‘u O‘o Trail, Kaumana Trail

DOFAW also manages existing trails within the proposed critical habitat:

— Unit Z: Kiholo-Pu‘u Wa‘awa‘a Trail, Hualalai Trail.

Na Ala Hele receives Federal funding annually from the Federal Highways Administration (FHWA), which it allocates to the different islands by dividing them equally. The funds are used for road and trail restoration and maintenance projects based on need, and may also be used for trails and access roads managed by other divisions of DLNR, such as DOFAW, depending upon maintenance needs. Despite Federal funding, the maintenance of trails and roads would not be subject to section 7 consultation because they are existing man-made features. Indirect effects of the road and trail maintenance activities on the surrounding areas are generally minimal.

Na Ala Hele staff indicate that no new trails or access roads are expected within the proposed critical habitat on the Big Island in the next 10 years. However, DOFAW may construct new trails in the next 10 years. The draft Pu‘u Wa‘awa‘a management plan proposes to construct new trail segments that provide access to the Pu‘u Wa‘awa‘a cone and accommodate recreational pursuits such as mountain biking and horseback riding. The Pu‘u Wa‘awa‘a cone access trail is likely to be 1.2 miles. Based on the planned budget, there are plans for one more trail segment, but it will be smaller. Thus, it is assumed that there will be two miles of new trails constructed in the proposed critical habitat over the next 10 years. DLNR plans to prepare an Environmental Assessment (EA) in accordance with Hawai‘i law for these trails.

Potential Project or Activity, Next 10 Years: Construction of two miles of new trails

Activities involved in trail building include removing vegetation, defining the trail corridor and constructing the trail bed.

Federal involvement: Funding from FWHA Recreational Trails Program

Consultations and Costs:

C Total Section 7 Cost: $5,200

The cost estimate is based on (1) one consultation; (2) the Low cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no survey since the preparation of an EA will include a survey of the planned trail route. All of the consultation costs are conservatively assigned to the plants, even though the consultation may also address other wildlife species that may be present.

Anticipated Project Modifications and Cost: None

The Service indicates that project modifications for new trails would include having a biologist on site when the final routes for the trails are determined, so the trail will avoid the listed plants. A review of completed EAs across the State indicates that this type of biological monitoring is standard practice in biologically sensitive areas. Since DOFAW plans to prepare an EA for the new trail segments in the proposed critical habitat, the cost of the project modification will be attributable to the baseline protections (i.e., the EA) and not to the plant listings or critical habitat.

Potential Entities Impacted:

Federal: Service, FWHA
State: DLNR

3.p. Drug Enforcement

The isolation and year-round warm temperatures make many of the proposed critical habitat units ideal locations for the cultivation of illegal drugs, such as marijuana. The U.S. Drug Enforcement Agency (DEA) and DLNR team up to locate, seize, and destroy as many illegal plants during periodic surprise raids. In the remote areas, these raids are conducted by helicopter. Once an illegal plant is spotted the helicopter drops to the location so the enforcement officials can pull up the plan or treat it with herbicide. These herbicide treatments are highly localized and only affect the plants in a small area (DLNR, 2002).

Potential Project or Activity, Next 10 Years: Illegal drug raids

Federal involvement: Funding or involvement by the DEA

Consultations and Costs:

C Total Section 7 Cost: $5,200 to $31,400

The cost estimate is based on (1) one to two consultations; (2) Low to Medium cost from Table VI-1 of a consultation with a non-Federal agency as the Applicant; and (3) no survey since identifying the area that will be raided could defeat the purpose of the surprise raid.

Anticipated Project Modifications and Cost:

C Total Section 7 Cost: $187,500 to $225,000

The Service indicates that project modifications for marijuana raids could involve a biologist traveling with the enforcement officials to ensure that no listed plants are harmed when the illegal plants are removed or destroyed. Depending on the amount of funding, DLNR conducts the aerial raids an average of 25 to 30 days per year. Based on the average daily rate of for a biologist of $750 per day, this project modification would cost between $18,750 to $22,500 per year (25 * $750, 30 * $750), or $187,500 to $225,000 over 10 years.

Based on the limited amount of disturbance caused by pulling up or treating the illegal plants with herbicide, additional project modifications are not anticipated.

Potential Entities Impacted:

Federal: Service, DEA
State: DLNR

3.q. Natural Disasters

The most likely natural disasters to affect proposed critical habitat would be a major hurricane passing over the Big Island, a *tsunami*, or wildfire. While the Big Island has not been directly hit by a hurricane in the past 50 years, it remains a possibility. In the mountainous regions proposed for critical habitat, wind and water damage caused by a major hurricane could include downed trees and branches as well as washed out roads, trails, and irrigation ditch systems. While little *tsunami* activity has occurred in the past 30 years, *tsunamis* have caused more deaths than any other natural disaster in Hawai‘i. A *tsunami* hitting the Big Island coast could cause significant damage to the shoreline and to plant life. Finally, all islands have experienced dangerous wildfires in the past that have caused significant damage to wildlife and watershed areas. Recovering from any of these natural disasters could involve clearing away downed trees, branches, and other debris, and rebuilding damaged structures.

3.q.(1) Federal Emergency Management Agency (FEMA)

In the event of a natural disaster, FEMA may provide individual assistance in the form of low-interest loans, cash grants, housing assistance, etc. FEMA also has a Public Assistance Grant Program that provides disaster aid to State and local governments to repair, replace, or supplement parts of a community’s infrastructure damaged in a natural disaster.

Potential Project or Activity, Next 10 Years: Possible recovery from a natural disaster

Federal Involvement: Financial assistance from the Federal Emergency Management Agency (FEMA)

Consultation and Costs:

In the event of a natural disaster, a consultation with the Service would be required if financial assistance is sought from FEMA to help residents, businesses or the government recover from the occasional natural disaster in areas where there are listed species and/or critical habitat. In such emergencies, the Service expedites consultations.

C Total Section 7 Costs: $3,800 to $7,500

Estimate is based on five to 10 days of effort by Service biologists to review the proposed projects at approximately $750 per day. While other listed species may be present, all costs of the consultation are assigned to the plants even though the consultation may also address the other listed species.

Anticipated Project Modifications and Costs: Minor

As long as recovery projects are planned so that they avoid further damage to critical habitat, which is likely to be the case, the proposed plants critical habitat designation would have little or no economic impact on FEMA projects following a natural disaster.

3.q.(2) USDA Farm Service Agency Disaster Assistance

Other natural disasters, such as flooding or drought, in the proposed critical habitat could affect agricultural land and infrastructure. The FSA has several programs designed to aid farmers and ranchers affected by natural disasters. These programs are summarized below:

— Emergency Conservation Program (ECP): ECP provides emergency funding for farmers and ranchers to rehabilitate farmland damaged by wind erosion, floods, hurricanes, or other natural disasters, and for carrying out emergency water conservation measures during periods of severe drought.

— Non-insured Crop Disaster Assistance Program (NAP): NAP provides financial assistance to eligible producers affected by natural disasters. This federally funded program covers non-insurable crop losses and planting prevented by disasters.

— Emergency Loan Assistance (EM): EM provides emergency loans to help producers recover from production and physical losses due to drought, flooding, other natural disasters, or quarantine.

— Emergency Haying and Grazing Assistance: This program allows haying and grazing of certain Conservation Reserve program acreage in areas suffering from weather-related natural disasters.

If the proposed critical habitat is affected by a natural disaster, some of the farmers and ranchers may elect to participate in one or more of these FSA programs.

Potential Project or Activity, next 10 years: Agricultural disaster recovery projects

Federal Involvement: Financial assistance from the FSA

Consultation and Costs:

In the event of a natural disaster, a consultation with the Service would be required if financial assistance is sought from FSA by farmers and ranchers in critical habitat. In such emergencies, the Service expedites consultations.

C Total Section 7 Costs: $3,800 to $7,500

Estimate is based on five to 10 days of effort by Service biologists to review the proposed projects at approximately $750 per day.

Anticipated Project Modifications and Costs:

C Total Section 7 Costs: Minor

As long as recovery projects are planned so that they avoid further damage to critical habitat, which is likely to be the case, the proposed plants critical habitat designation would have little or no economic impact on FEMA projects following a natural disaster.

Potential Entities Impacted:

Federal: Service, FSA

3.r. Ecotourism

Hawai‘i is an ecotourism destination with an emphasis on exploring the environment. The Big Island has numerous destinations for exploring the natural environment with hundreds of miles of State park trails, waterfalls, rain forests and volcanoes. Commercial hiking tours and horseback riding, led by professional naturalist guides and featuring Hawai‘i’s unique ecosystems and endemic plants, are also offered on the Big Island. In addition, ocean and coastal tours offer chances to view fish, dolphins and the endangered hawksbill turtles found on the beaches of the Big Island. As noted in Section 3.o., the proposed critical habitat designation contains multiple hiking trails.

Many of the areas proposed for critical habitat designation are areas of significant natural beauty and cultural value, qualities that also make these areas attractive for ecotourism. For example, the State is exploring the development of short- and long-term commercial ecotourism activities in Unit Z as part of the Pu‘u Wa‘awa‘a Management Plan. In addition to hiking, these activities could include bird watching, horseback riding, caving, and camping.

Potential Project or Activity, Next 10 Years: Commercial hiking, horseback riding, birdwatching, caving, and camping trips and tours

Federal Involvement: None

Anticipated Costs of Consultations and Project Modifications: None

No consultations or project modifications are anticipated because the activity does not have *Federal involvement*.

4. INDIRECT COSTS

4.a Introduction

Aside from the protection provided by the Act as described in Chapter III, the Act does not provide other forms of protection to lands designated as critical habitat. Because consultation under section 7 only applies to activities that have *Federal involvement*, the designation of critical habitat does not afford any additional regulatory protections for listed species with respect to strictly private activities.

However, designation of critical habitat may have indirect impacts beyond those associated with the Act. For example, designation may provide the impetus for the State and counties to require additional protections for designated critical habitat that would not otherwise be subject to such protections. These protections may affect both the management of affected lands as well as State and county development approvals. Also, the critical habitat designations could affect property values. While there is uncertainty on whether any or all of these indirect impacts may actually occur and the extent of those impacts if they do occur, possible indirect impacts of the proposed designation are addressed below.

4.b Management of Game Mammals and Loss of Hunting Lands

4.b.(1) The Game-Management Issue

One of the major issues surrounding the proposed critical habitat designations concerns the management of game-mammal populations (i.e., feral pigs, goats and sheep) and the potential loss of valued hunting lands. This is a highly sensitive issue throughout the State that for decades has been debated among environmental groups, hunters, biologists and government agencies. The concern does not extend to game birds, however, since the Service currently believes that these birds and the hunting of them do not have a significant adverse impact on listed species or their habitats.

As discussed in the proposed rule, the major threat to the survival and conservation of Hawai‘i’s native plants comes from ungulates, combined with competition from non-native plants. Ungulates feed on the succulent seedlings, stems and roots of various native plants; trample native groundcover and uproot seedlings and other low-growing plants; and create openings and sites where invasive non-native plants can become established and spread. Finally, ungulates carry seeds of non- native weedy and invasive plants in and on their bodies, thereby distributing invasive plants to new areas, especially along trails, in and around wallows, and in areas that have been rooted up or grazed. Many invasive non-native plants are able to colonize newly disturbed areas more quickly and effectively than can the native plants.

As discussed in the proposed rule, the Service believes conservation goals for endangered Hawaiian plant species cannot be achieved when feral ungulates are present in “essential habitat areas.” Ranked in order of importance, the first of 13 recommended management actions needed to assure the survival and conservation of Hawai‘i’s endangered plants is “feral ungulate control.”

Consistent with this finding, the Service does not support land management actions that maintain or enhance populations of free ranging feral ungulates in areas having vulnerable plant species.

Measures to control feral ungulates in protected areas typically include strategic fencing, or barrier fencing, to prevent or limit their migration into designated areas; exclosure fencing to prevent ungulates from entering protected areas; organized hunting to remove them from protected areas; and monitoring ungulate activity so land managers can direct hunters to problem areas. If increased hunting pressure does not reduce feral ungulate activity, land managers may work with hunters to identify and implement alternative methods, which may include trapping in remote areas. All of these activities may reduce the number of game mammals available to hunters and the sizes of hunting areas.

Approximately six percent of the Big Island's resident population are hunters. While many hunters accept the need to protect limited portions of the native forest from damage by ungulates, the majority of hunters strongly oppose removing game mammals from large portions of existing hunting areas. Hunters believe that recent conservation fencing projects have reduced the success rates of their hunting trips. Furthermore, many hunters fear that critical habitat designation will lead to a loss of prized hunting areas as was the case with the court-ordered eradication of sheep and goats from the *palila* critical habitat on the Big Island 20 years ago (see Appendix VI-A). Instead, most hunters advocate that game-mammal populations continue to be sustained at levels that are sufficient to allow recreational and subsistence hunting in all but possibly a few of the existing State Hunting Units. They also see themselves as important contributors to controlling feral ungulate populations at reasonable levels and at little cost to the taxpayer.

Also, hunters have expressed concern that critical habitat designations could affect wildlife management projects proposed for Pittman-Robertson funding. The concern is reinforced by the perception that the Service, over the objections of DLNR, withheld Pittman-Robertson funds for game-management projects in areas proposed for critical habitat designation (see Appendix VI-A for more information on hunting in Hawai‘i).

4.b.(2) Indirect Impacts on Game Management

Section 7(b)(2) of the Act by itself does not require DLNR to manage State hunting lands to protect critical habitat; assure the survival and conservation of listed species; or participate in projects to recover species for which critical habitat has been established. That is, critical habitat designation does not require (1) creating any reserve, refuge, or wilderness areas; (2) fencing for any reason; (3) removing ungulates; or (4) closing areas to hunters. Instead, it requires only that, if DLNR seeks to undertake an activity that may affect the designated area using Federal funding or with a Federal permit, the Federal action agency consult with the Service which must ensure that its actions are not likely to jeopardize listed species or adversely modify critical habitat. Furthermore, DLNR can use Federal Pittman-Robertson funds to selectively fund game-management projects that do not affect critical habitat, thereby obviating the need for consultations on game management in these areas.

However, critical habitat designation may add weight to the argument that game-mammal populations should be eliminated or reduced substantially in affected areas because they threaten Hawai‘i's native plants. In turn, DLNR may elect to change its game-management strategies to reflect this shift in priorities.

4.b.(3) Indirect Impacts on Hunting Conditioned on a Change in Game Management

Assuming, for the sake of illustration, that DLNR adopts a policy of reducing game-mammal populations substantially in the State Hunting Units that overlap critical habitat units, then the following impacts related to hunting could be expected.

Hunting Activity

Initially, the number of hunting trips into the more accessible critical habitat units would increase. But after the populations dropped to lower levels, the number of hunting trips into these units would probably drop also because of low success rates.

Some hunters might continue to hunt in critical habitat units for the wilderness experience, and some might switch to hunting game birds. But the most likely outcome is that most of them would switch to State Hunting Units outside the proposed critical habitat, increasing hunting pressures in these areas even more. And some hunters might choose to hunt less or not at all, spending their discretionary time and funds instead on other recreational pursuits. Finally, some hunters may switch to hunting on privately-managed hunting lands.

Economic Activity

A reduction of hunting activities on the Big Island would result in a reduction in economic activity. To illustrate the magnitude of the impacts on the Big Island, if about half of those who hunt game mammals on the affected lands were to give up hunting, then hunting activity could drop by about 38 percent (half of 75 percent, which is the percentage of hunting activity supported by the State Hunting Units in critical habitat estimated in Section 3.a. above). This translates into an annual decrease in economic activity related to hunting on the Big Island of about $1.3 million in direct sales (38 percent of $3.4 million); $2.3 million in total direct and indirect sales (38 percent of $6 million); 38 jobs (38 percent of 100 jobs); and $760,000 in income (38 percent of $2 million). Over 10 years, this would equal $13 million in direct sales, $23 million in total direct and indirect sales, and $7.6 million in income. Total economic activity related to hunting on the Big Island is documented in Appendix VI-A.

For the most part, the $13 million decrease in expenditures by the displaced hunters over 10 years would probably be spent on other activities, goods and services. This would create economic activity that would offset the decrease in economic activity related to the reduced expenditures on hunting. Thus, the net economic impact could be small. However, there would be distributional impacts, with some providers of goods and services benefitting at the expense of the stores and service- providers catering to hunters.

Hunter Benefits

Although a reduction in hunting activity would probably result in a small net change in economic activity, it would result in a loss in value or benefit to hunters (consumers' surplus)—see Appendix VI-A for the total benefits related to hunting on the Big Island. Under the given assumptions, this annual loss is estimated at $684,000 (38 percent of the $1.8 million in surplus value). Over 10 years, this would result in a loss of $6.8 million in hunter benefits. But partially offsetting this loss to hunters would be benefits derived from activities that replace game-mammal hunting.

Value of Hunting Meat

Many hunters view hunting as a subsistence activity on both a short- and long-term basis. The sugar plantation closures and increased unemployment due to a fluctuating tourist industry have caused many individuals to rely on hunting to save money on groceries and ensure that food is available to their families. Some hunters believe that possible future economic downturns, war, and shipping strikes may increase the need for subsistence hunting even for individuals who are not currently financially strained.

Based on information gathered from the hunting community on the Big Island, many hunters practice subsistence hunting and use frequent hunting trips to provide meat for their families. An informal questionnaire filled out during a hunting club meeting indicates that most hunters go hunting on a weekly basis and typically catch at least one game animal on half or more of these trips. These game animals include pigs, goats, sheep and deer.

Most hunters supplement their families' food supplies with the meat from game animals. Some hunters also value the organic quality of game meat, since it is free of chemicals, hormones, and other additives that are found in most meat in the supermarket. Active pig hunters indicate they kill an average of 30-50 pigs per year and the average value of the meat after dressing is $150 per pig. Thus, if a hunter had to purchase an equivalent quantity of meat at the store, it would cost between $4,500 to $7,500. Hunters may consume this meat or barter it for vegetables and other food supplies. Hunters also share portions of the meat with family and friends, and provide meat to individuals in difficult financial circumstances. (Pig Hunters of Hawai‘i, Wildlife Conservation Association, 2002).

Social and Cultural Value of Hunting

Many families on the Big Island have been hunting for generations. Hunting is seen as a family activity and hunting knowledge is typically passed on from parent to child. Therefore, many hunters see hunting as an integral part of their families' lifestyle, traditions, and culture.

Many major family and social activities involve the preparation and consumption of game animals. For example, luaus, birthdays, graduations, and other celebrations usually include the roasting of a whole pig. Whole pigs are not typically available in a grocery store. In addition, certain ceremonial blessings require a wild pig and can not be conducted with a meat from the store. Thus, hunting activity is a central part of social and family events.

Hunting also strengthens the bonds between generations and allows children to learn valuable educational skills regarding nature, survival, orienteering, as well as hunting skills. Since the other social activities in rural communities are limited, hunters view hunting as an important way to ensure the youth have a positive activity through which they learn useful skills. There is a real concern that youth delinquency and crime may increase without hunting activities.

Finally, as discussed in Chapter II, the large amounts of relatively inexpensive land on the Big Island has attracted people that wish to be self sufficient and hunting is seen as an important part of this lifestyle. This trend is likely to continue in the future.

Pittman-Robertson Funding

In some states, a reduction in the number of licensed hunters could reduce the amount of Federal Pittman-Robertson funding the State receives. The reason for this is that the formula used to calculate the distribution of funds is based in part on the number of licensed hunters. However, Hawai‘i currently receives the minimum amount of funding.

Thus, any drop in the number of hunters would have no effect on the amount of funding Hawai‘i receives. Furthermore, if a Pittman-Robertson project is denied by the Service, or DLNR decides not to proceed with a proposed project, the associated Pittman-Robertson funds would not be lost. Instead, DLNR could use the funds to support another wildlife management project.

State Expenditures

Finally, DLNR would probably have to expend more funds to maintain low game-mammal populations in areas that no longer attract hunters because of low success rates, and to control non-native plants and weeds in degraded areas where large populations of game mammals no longer browse.

4.b.(4) Probability of a Change in Game Management

The above outcome would occur if the State were to adopt a new policy to reduce game-mammal populations substantially in critical habitat units that overlap with State Hunting Units. However, without intervention from a third party, a major change in State management of game mammals on the Big Island is not expected.

As mentioned above, the debate about the management of game-mammal populations is a highly divisive and contentious one that has been argued for many decades in Hawai‘i—a debate that long preceded the plant species listings and proposed critical habitat designations. Critical habitat designation would not change the nature of the debate significantly, but it may expand or refine the geographic focus.

But, even with the added weight of this argument, the probability is small that the State would adopt a policy to substantially reduce game-mammal populations in critical habitat units that overlap with State Hunting Units. This judgment is based on discussions with DLNR, others familiar with the subject, and decades of public testimony by hunters. Simply put, the scenario is not regarded as realistic: hunters would vigorously oppose a proposed reduction in game populations.

In addition to opposition from the hunting constituency, there are concerns within DLNR about the cost and feasibility of the removal of large numbers of game mammals from over 437,000 acres. The most costly item would be removing ungulates from less accessible areas and the stragglers remaining after hunters lose interest when their success rates drop. DLNR could utilize helicopters at this stage to hunt game, but this is expensive and ineffective in forested areas. Also, snares could be used to trap animals, but DLNR believes that checking them daily is costly; they pose risks to hunting dogs; they are regarded as inhumane; and they evoke complaints from the public.

Once the game mammal populations are reduced, there are additional concerns within DLNR about the cost of maintaining low populations—particularly if hunters are not interested in hunting

in an area due to low success rates or difficult access. And where strategic fencing is in place, there are concerns about the periodic cost of repairing or replacing sections of fencing that have been vandalized.

4.b.(5) Summary

The probability of a major State-initiated change in game management in Hawai'i is regarded as small, even though the proposed critical habitat designation would add weight to the argument that game-mammal populations should be reduced substantially in affected areas. If a major change in game management did occur, the 10 year economic impacts would include a loss of $13 million in direct sales, $23 million in total direct and indirect sales, $7.6 million in income, and $6.8 million in hunter benefits. Partially offsetting these loss would be economic activity generated by, and benefits derived from, activities that replace game-mammal hunting. However, additional losses would include the value of the hunting meat to the hunters and their families, as well as the social and cultural value of hunting to the community.

4.c. State Redistricting of Land

4.c.(1) Concerns about Redistricting

A concern raised by private landowners is that once critical habitat is designated on their land, the State may redistrict it from the Agricultural, Rural, or Urban District to the Conservation District. In turn, this will result in (1) a potential loss in current or future economic use of the land; (2) a reduction in the value of the land; and (3) reduced ability to secure financing.

Even if land is not redistricted, landowners are concerned that the State may seek agreements with landowners to protect the habitats of listed species as an incentive to retain their existing District designation.

Finally, even a concern about redistricting can make it more difficult for developers to secure financing for a project. If investors perceive that critical habitat raises the risk of redistricting, they may be less likely to finance a project. If alternate sources of investment are not available, the project may not proceed.

4.c.(2) Affected Lands

On the Big Island, approximately 28,953 acres of privately owned land in the Agricultural District are proposed for critical habitat. Approximately 580 acres of privately owned land in Units Y1 and Y2 are in the Urban District. In addition, there are 480 acres of State owned land in the Urban District in Unit Y2 and 872 acres of State owned land in the Agricultural District in Units E and F that are planned for development.

There are approximately 187 acres of land in the Conservation District in Unit Y1. The land value of this area is high because there is currently a reasonable probability this parcel will be redistricted from the Conservation District to the Urban District at some point in the future. This is because the area is bounded on all sides by the parcels in the Urban and Agricultural Districts and is designated as "urban expansion" in the Hawai'i County General Plan. Critical habitat may affect these parcels by reducing the probability that they will be redistricted from the Conservation District to the Urban District.

4.c.(3) Probability of Redistricting

The concern about potential redistricting of land designated as critical habitat stems from State statutes for Conservation of Aquatic Life, Wildlife and Land Plants (HRS, 195D) and the Land Use Commission (HRS, 205):

— Protection of Hawai'i's Unique Flora and Fauna (HRS 195D-5.1)

DLNR "… shall initiate amendments to the Conservation District boundaries … in order to include high quality native forest and the habitat of rare native species of flora and fauna within the Conservation District."

— Districting and Classification of Lands (HRS 205-2(e))

"Conservation Districts shall include areas for conserving indigenous or endemic plants, fish and wildlife, including those which are threatened or endangered."

— Land Use Commission Decision-making Criteria (HRS 205-17)

"In its review of any petition for reclassification of district boundaries …, the commission shall specifically consider … the impact of the proposed reclassification on … (the) preservation or maintenance of important natural systems or habitats."

DBEDT's Office of Planning (OP) is responsible for conducting a periodic review of State District boundaries, referred to as the "boundary review." During the boundary review, OP considers whether the existing District boundaries are appropriate, taking into account current land uses, environmental concerns, and other factors. Critical habitat would prompt OP to consider redistricting from the Agricultural, Rural or Urban Districts to the Conservation District (DBEDT, OP, 2002).

However, agency-initiated redistricting of privately owned land is likely to occur in only a limited number of cases. This assessment is based on the following:

— Critical habitat designation alone would not prompt the State to propose redistricting. A number of other factors would come into play, such as the quality of the native habitat, the value of the land as watershed, slopes, etc. (DBEDT, Office of Planning).

— Approval of redistricting requires six affirmative votes from the nine commissioners, with the decision based on a "clear preponderance of the evidence that the proposed boundary is reasonable" (HRS 205-4).

— Private landowners strongly oppose proposals to redistrict their lands if they believe this might result in a decrease in property value and/or a loss in the economic use of their lands. Furthermore, they may file lawsuits claiming an unconstitutional taking of property.

— In the last State District boundary review, only four privately owned parcels were redistricted to Conservation, even though several hundred were proposed.

Nonetheless, in view of State law, there is a risk of a successful third-party lawsuit that would force redistricting on one or many parcels in critical habitat. Even if redistricting does not occur, this risk can make investments in developments in critical habitat less attractive, and make it more difficult for developers to obtain financing and proceed with their projects as planned.

4.c.(4) Cost of Contesting Redistricting

Even though the probability of State agency-initiated redistricting private land to Conservation may be low, contesting a redistricting action can be time-consuming and costly for the landowner. Based on the last boundary review, some landowners report spending over $50,000 contesting such an action. Since approximately 39 private landowners on the Big Island own land in either the Agricultural or Urban District, this could cost almost $2 million. In case of a lawsuit to force redistricting, however, the costs could be much higher.

4.c.(5) New Restrictions on Land

Even if land is not redistricted, the State may seek agreements with landowners to protect the habitats of listed species as an incentive to retain their existing District designation. Based on the last boundary review, this could involve agreements to reforest lands using native species, or to not subdivide or develop land that is habitat for listed species. Such requirements restrict future land use, thereby lowering property values.

4.c.(6) Cost of Reduction in Agricultural Use of the Land

If land is redistricted to Conservation, agricultural activities could continue depending upon which subzone is assigned: typical agricultural activities are not allowed in the Protective Subzone, but are allowed in other subzones with permission of the State Board of Land and Natural Resources (BLNR).

Many areas of critical habitat have been grazed for over a hundred years. There are few natives forest remnants left in these areas, and those that do remain have adapted to the presence of cattle or are fenced to exclude cattle. Since these historically grazed areas are highly degraded from their natural state, they are not anticipated to meet the standards of a natural ecosystem required to be put in the Protective Subzone (HAR §13-5-11). Further, cattle can indirectly enhance the ecosystem by reducing fire danger and controlling non- native weeds. It is possible that areas that have previously been used for ranching will not be placed in the Protective Subzone, and grazing can continue with BLNR approval.

If lands in critical habitat are redistricted to a subzone other than the Protective Subzone, a rancher or landowner will need to get a Conservation District Use Authorization (CDUA) permit to obtain BLNR approval to allow grazing in the Conservation District. The cost of obtaining a CDUA can be between $25,000 and $100,000 (based on information from planning consultants, 2002). It is assumed that any large landowner that allows grazing for ranching or weed control purposes on their land will obtain and CDUA permit. There are 13 large landowners who allow grazing in critical habitat on the Big Island. Since some smaller landowners or lessees may also obtain CDUA permits, the total number may range from 20 to 30. Based on this information, the total cost to agricultural activities if land in the Agricultural District was redistricted to the Conservation District would be $500,000 to $3 million (20 x $25,000; 30 x $100,000).

However, it is possible that court-ordered redistricting due to critical habitat could result in all of the land being placed in the Protective Subzone. This could result in the cessation of existing ranching activities and the loss of the associated economic activity. As noted in the direct costs section above, the proposed critical habitat contains 36,900 acres of important agricultural land, or 6.6 percent of the total important agricultural land on the Big Island. Some of this land may support small scale farming; however, any land that is actively used for crops is not likely to contain the *primary constituent elements* for the listed plants and is not considered critical habitat. As such, it is assumed that all 36,900 acres of important agricultural land is used for grazing.

If all of the grazing land in critical habitat was redistricted to the Protective Subzone, the loss in revenues is estimated at about $923,000 per year (based on an estimated carrying capacity of 10 acres per animal unit, $250 per animal unit per year, and 36,900 acres of grazing land (36,900/10 * $250)). Companies that supply goods and services to ranches and the employees of these ranches in turn purchase goods and services from other companies, thereby generating even more sales, and so on. When both direct and indirect sales and employment are considered, the total statewide loss amounts to about $1.9 million per year, or $19 million over 10 years (based economic multipliers from the Hawai‘i Input-Output Model). This economic activity also supports roughly 56 jobs.

4.c.(7) Cost of Loss of Development Due to Redistricting

As noted above, redistricting of privately owned land is likely to occur in only a limited number of cases, if any, unless a lawsuit forces redistricting. If this were to occur, development projects would not be able to continue as planned, and possibly not at all. The types of economic activity lost include (1) the amount of money already invested in the project (sunk costs); (2) the expected profits that will not be realized due to redistricting (future profits); and (3) the loss to the general economy if the development can not proceed as planned (ripple effects). In certain cases, the loss of a planned development will result in social costs that can not be expressed in economic terms. These social costs are discussed qualitatively where appropriate.

The primary development projects with publicly available plans in critical habitat include residential development (the State VOLA master planned community in Unit Y2; DHHL developments in Units Y2, E, and F; and the PIA subdivision in Unit Z); and industrial, commercial, and other urban development (the Keahuolu Project in Unit Y2; the Kohanaiki Business Park expansion and the Kaloko Industrial Park expansion in Unit Y1). It is not known how redistricting or the risk of redistricting will affect each project. However, the potential economic and social costs associated with the loss of each these planned developments are discussed below for illustrative purposes.

State VOLA Master Planned Community

The State has already invested $30 million (sunk costs) in the VOLA master planned community. This figure includes money spent on building roads, installing utilities, planning, developing an EIS, and a payment to the county to expand the wastewater treatment plant (HCDCH, 2002).

There are approximately 1,700 homes planned in the portions of the villages that are included in critical habitat in the VOLA master planned community. Approximately 1,020 of these homes (60 percent) will be affordable housing units. In most projects with a relatively high percentage of affordable housing units, the profits from the market-priced units typically offset the losses

associated with building the affordable housing units. As such, the project is not expected to make significant future profits.

However, affordable housing is viewed as a social good and an essential component of a developing community. As part of the permitting process, the Hawai‘i County Office of Housing and Community Development (OHCD) requires that each developer include a certain number of affordable housing units in their project plans. If the developer is unable to provide these units, the developer must pay $4,720 to the county for each unit not built (OHCD, 2002). Using this value as a proxy for the social value of affordable housing, the loss of 1,020 affordable units in the VOLA development equates to a loss of almost $4.8 million to the community. This loss could be offset if additional affordable housing units are built elsewhere, however, the State indicates that if it is unable to continue with the VOLA development, a new affordable housing development of this size is not likely to be completed in the next 10 years (HCDCH, 2002).

DHHL Housing Projects

While the proposed critical habitat overlaps with a much of DHHL land, most of the DHHL parcels are not identified as priority areas for development for the reasons listed in Section 3.b. above. Only the Humu‘ula-Upper Pi‘ihonua and the Kealakehe parcels are identified as priority areas for development in critical habitat. The portions of the Humu‘ula-Upper Pi‘ihonua parcel included in critical habitat could support the construction of approximately two to three homes and the portion of the Kealakehe parcel included in critical habitat could support the construction of approximately 10 to 11 homes over the next 10 years.

Development at the Kealakehe parcel will take advantage of existing infrastructure for the VOLA development mentioned above. Additional infrastructure on the potions of the Humu‘ula-Upper Pi‘ihonua and the Kealakehe parcels in critical habitat has not been built. As such, the only sunk costs are the funds DHHL has expended to identify these areas for development. However, since only a small portion of the projects could be affected by critical habitat (two percent of Humu‘ula-Upper Pi‘ihonua parcel and three percent of Kealakehe parcel), the planning efforts will still be utilized for development on the areas outside of critical habitat.

DHHL leases land to its beneficiaries at rates around $1 per beneficiary per year. As such, the economic benefit of DHHL housing projects is the value of the improved land. There are approximately 870 acres of the Humu‘ula-Upper Pi‘ihonua parcel in critical habitat. Based on the market property value of nearby improved parcels, the value of this land is roughly $5.1 million. There are approximately 1.8 acres of the Kealakehe parcel in critical habitat. Based on the market property value of nearby improved parcels, the value of this land is roughly $700,000. Therefore, the total value of DHHL parcels in critical habitat is approximately $5.8 million. This economic loss may be somewhat offset if DHHL is able to slightly increase the housing density in developments outside of critical habitat.

PIA Subdivision

The developer of the PIA subdivision in Unit Z has already invested $75 million (sunk costs) in a golf course, wells, water lines, lease acquisition, and planning (PIA-Kona Ltd., 2002). Since the proposed critical habitat only covers 840 acres (11 percent) of the 7,800 acre project, it is likely that areas outside of critical habitat will continue to be developed even if the areas in critical habitat is redistricted. However, the developer will not be able to develop at the full scale that is currently

planned. Since 11 percent of the development may be lost, it is assumed that 11 percent of the sunk costs, or $8.3 million, may be lost due to redistricting or the risk of redistricting.

The developer anticipates earning $100,000 in future profits for each home-lot in PIA subdivision (PIA-Kona Ltd., 2002). The current zoning and development plans allow for an average density of one home-lot per five acres, so the 840 acres in critical habitat could support roughly 170 home-lots. As such, the total loss in future profits if the area in critical habitat could not be developed is $17 million.

There are additional areas available for subdivision in the North Kona District, so if these 170 homes are not built in critical habitat, they are likely to be built elsewhere. Due to the availability of suitable land, any economic activity associated with agricultural subdivisions that is displaced within critical habitat is expected to occur elsewhere on the Big Island.

Keahuolu Project

As noted in the direct impacts section, Queen Lili‘uokalani Trust (QLT) has already begun development of 456-acre area that is planned to become the future “downtown” for Kailua-Kona. QLT uses revenue from its land holdings to provide care for orphans and destitute children, with a preference given to children of Native Hawaiian ancestry. Approximately 344 acres (75 percent) of the undeveloped portion of this area is included in Unit Y2. Almost all of the 112 acres of the project that are not included in Y2 are either (1) already developed at the highest and best use, (2) set aside for a archaeological preserve, or (3) oddly shaped parcels that will not support future development. As such, redistricting as a result of critical habitat could jeopardize almost all of the planned development in the Keahuolu Project *mauka* of the Queen Ka‘ahumanu Highway, and jeopardize the ability of QLT to carry out its mission.

QLT estimates it has invested between $9 million and $11 million (sunk costs) in the Keahuolu Project obtaining permitting for State Land Use Commission (LUC) and county zoning entitlements, developing a potable well for the project, and building on-site infrastructure including roads, sewer mains and collection lines, power and telephone, etc. In order to fund this investment, QLT abrogated from its standard policy and sold several large parcels of land *mauka* of the Keahuolu Project to the State. This action was a difficult decision for QLT to make, and it was only done since the prospect of economic returns of the Keahuolu Project was high (John M. Knox & Associates, Inc, 2002). If the proposed critical habitat designation stops the development at its current stage, all of the $9 million to $11 million in sunk costs and the land sold to the State cannot be utilized to generate revenue and to carry out QLT’s mission.

The planned development in the portions of Keahuolu Project that are included in critical habitat include a regional shopping center, several retail commercial areas, financial plaza, professional plaza, several office areas, a business hotel, a civic and cultural center, open space, and several interior roads. At full build-out, the Keahuolu Project is anticipated to generate $66.3 million (in 2002 dollars) in lease-rent revenues per year. Approximately $18.5 million of this will be generated by the areas outside of critical habitat, and $44.2 million will be generated by the areas inside critical habitat (John M. Knox & Associates, Inc., 2002). As such, if the planned development in the QLT lands is stopped due to redistricting or the risk of redistricting, the QLT will lose $44.2 million per year in lease-rent revenue after the project is fully built-out.

This estimate tends to overstate the total economic impact because it does not include additional funds that will have to be expended by QLT in order to reach full build-out, such as the

costs to build more off-site wells, additional interior roads, and additional planning. The estimate is also based on the assumption that the project will reach full build-out at some point in the future. An analysis provided in the 1990 EIS for the project projected that by 2020, the hotel, hospital, and approximately half of the commercial and office space would be completed. However, since 1990, population growth rates have slowed and absorption rates have been less than expected.

On the other hand, once portions of the project are completed and filled with tenants, the QLT will be able to collect lease-rent revenues on an annual basis, with little or no additional expenditures for as long as there is demand for the services of the buildings. So the total economic impact of the lost development is actually the present value of the future stream of lease-rent revenue. At full build-out and assuming a 10 percent discount rate and that the lease-rent will continue forever, this would equal $442 million in 2002 dollars ($44.2 million / 10 percent).

There is significant uncertainty regarding the (1) timing of construction of key project components, (2) the costs to reach full build-out, (3) the absorption rates, and (4) the lease rents at the time each component of the project is completed. However, if it is assumed that (1) one-fourth of the project within critical habitat would have been completed in the baseline scenario (i.e., absent critical habitat) within the timeframe of this analysis (10 years), (2) the costs to complete this segment (additional wells, interior roads, additional planning) are roughly $10 million (based on the historical costs of similar infrastructure at this site), (3) all of the buildings are filled once completed, (4) the lease rents are similar to 2002 rates, and (5) the discount rate is 10 percent for the future stream of lease-rent revenues, then the present value of the future lease-rents in 10 years will be approximately $110 million in 2002 dollars (($44.2 * 0.25) / 10 percent). If redistricting stops this development, the total economic impact will be the present value of the lost lease-rent revenues minus the amount of money spent to complete the development, or $100 million ($110 million - $10 million).

If development can not occur in the Keahuolu Project site, it will likely relocate elsewhere is the region, so any "ripple effects" to the economy will be minimal. However, the Keahuolu Project site is unique in that it is located adjacent to the existing center of Kailua Kona. There is currently high-density urban development on three of the corners of the intersection between the Palani Road and the Queen Ka‘ahumanu Highway. The Keahuolu Project is the fourth corner. It is also the site where most of the region's major roadways, utilities, and high-tech network converge.

State and county planners have also identified the importance of the Keahuolu Project site for urban expansion. Since 1971, the Hawai‘i County General Plan has designated a portion of site as "high-density urban." In 1991, the State Land Use Commission redistricted all of Phase I and Phase II of the site from the Agricultural District to the Urban District (75 percent of Phases I and II are included in Unit Y2). The 2001 draft Hawai‘i County General Plan extends the designation of high-density urban to include all of Phase I of the project. All of Phase II is designated as urban expansion.

In support of these plans, the State and Hawai‘i County have expended considerable amounts of time and money on infrastructure. If urban expansion at this site can not continue, the State and county will have to spend additional time and money preparing plans for a new site and building the infrastructure to support it. Since Unit Y2 includes most of the centrally located undeveloped land in Kailua-Kona, the new site could lead to urban sprawl and fragmentation of future development.

If development cannot occur in the Keahuolu Project site, there will be significant social costs. QLT is a non-profit organization, so all of the income it receives from its land holdings are

either reinvested in the trust, or used to carry out its mission of providing care for Native Hawaiian orphans and destitute children. The land holdings in Keahuolu are the primary source for additional revenue for the future of QLT programs. QLT does own a limited amount of land suitable for development outside of critical habitat. However, these lands are already planned for development and are less centrally located, so any loss due to critical habitat will displace future development and revenues for the QLT and its mission.

Finally, designation of QLT land as critical habitat could have political costs among the Hawaiian community. Queen Lili'uokalani was the last reigning monarch of the Hawaiian islands. The Queen was overthrown in 1893 by some prominent members of the business community with ties to America. During the overthrow, American troops landed to protect American lives and property. People in the Hawaiian community view the overthrow as losing their kingdom and their land. The overthrow and America's involvement remains a highly sensitive and often debated issue even today. If critical habitat should adversely affect development of QLT lands, members of the Hawaiian community may view it as another case of the U.S. government stealing Hawaiian land without just compensation. This could have significant political costs and may damage relations with the Hawaiian community.

Kohanaiki Business Park Expansion

The developer of the Kohanaiki Business Park has completed an EIS and was recently granted a change from the Conservation District to the Urban District. The first completed phase of this project consists of 25 one- to two-acre improved lots, most of which are in Unit Y1. As mentioned in Chapter I, these graded lots do not contain the *primary constituent elements* and will be excluded from the final rule. However, most of the land in the second phase of the project has not been graded and is included in Unit Y1. No major roadways or infrastructure have been installed in the expansion area.

Based on the average parcel size in the existing park, the 40-acre expansion parcel in or affected by critical habitat would contain 34 lots. If redistricting stops the planned development at this site, the landowner would lose the profits associated with the sales of the lots. The roads and other improvements may be constructed within the next few years. If redistricting occurs after these improvement are in place, the economic impact will be the full selling value of the lots. Based on the assessed values of lots of the same size in the existing portion of the Kohanaiki Business Park, each of the future lots will sell for roughly $360,000, so the total economic loss would be $12.2 million (34 x $360,000) (Hawai'i County Real Property Tax Office, 2002).

There are several other commercial/industrial projects planned in the immediate vicinity of the Kohanaiki Business Park expansion that are not included in critical habitat. Any development that can not occur in critical habitat will likely relocate to another site outside of critical habitat. Thus, the net effect to the regional economy is expected to be minimal. However, as mentioned above, the costs to the affected landowner could be large.

Kaloko Industrial Park Expansion

The developer of the Kaloko Industrial Park expansion has completed an EIS and recently was granted a change from the Conservation District to the Urban District. However, roads and other improvements have not been installed on the site. Based on the cost of preparing an EIS and other planning efforts, the total amount of money invested in this project is likely to be on the order of $500,000 in sunk costs (based on information from Hawai'i planning firms, 2002).

Approximately 68 of the 82 lots in the planned Kaloko Industrial Park expansion are in Unit Y1. If redistricting stops the planned development at this site, the landowner would lose the profits associated with the sales of the lots. The roads and other improvements are expected to be constructed within the next few years. If redistricting occurs after these improvements are in place, the economic impact will include the full selling value of the lots. Based on the assessed and selling values of lots of the same size in the existing portion of the Kaloko Industrial Park, each of the future lots will sell for roughly $400,000, so the total economic loss would be $27.2 million (68 x $400,000) (Hawai‘i County Real Property Tax Office, Hawai‘i Information Service, Yamanaka Enterprises, Inc., 2002).

There are several other commercial/industrial projects planned in the immediate vicinity of the Kaloko Industrial Park expansion that are not included in critical habitat. Any development that can not occur in critical habitat will likely relocate to another site outside of critical habitat. Thus, the net effect to the regional economy is expected to be minimal. However, as mentioned above, the costs to the affected landowner could be large.

4.c.(8) Reduction in Property Values Due to Redistricting

Most of the landowners in critical habitat do not currently have public plans for development. However, the property values reflect that these areas could be developed at some point in the future. If the entire area was redistricted to the Conservation District, much of the development potential would be lost. The economic impacts associated with a loss in property values are discussed below.

All of the land in the Urban District in the proposed critical habitat is currently planned for development and included in the discussion above. As noted in section 3.b. above, certain areas in the proposed critical habitat units in the Agricultural District have long-term development potential, even if development is not currently planned. Section 3.b. above also identifies the reasons that other areas in the Agricultural District do not have development potential (lack of access, climate, location, natural features, etc). In addition, some land in the Conservation District in Unit Y1 has development potential because it may be redistricted to the Urban or Agricultural District at some point in the future.

The areas in critical habitat that could support residential or urban development can be grouped by general geographic region on the Big Island. In general, property values differ by region. The following list summarizes the critical habitat units, number of acres suitable for future development,[14] and the range of property values for each region:[15]

— South Kohala/North Kona District (Units B and Z): Approximately 6,950 acres in the Agricultural District in this region have future development potential. The average land values range from $10,000 to $20,000 per acre,

[14] The number of acres excludes areas that are already developed at their highest and best use, areas that are currently planned for development (to avoid double counting the economic impacts mentioned in the previous section), and areas that are not likely to be developed based on existing land management or other natural restrictions.

[15] Property value estimates based on Hawai‘i County Real Property Tax Office assessment of market values, independent assessments, real estate data, and the opinions of landowners.

so the total land value in critical habitat ranges from $69.5 million to $139 million.

— North Hilo District (Units E and F): Approximately 1,090 acres in the Agricultural District in this region have future development potential. The average land values range from $5,000 to $10,000 per acre, so the total land value in critical habitat ranges from $5.5 million to $10.9 million.

— Puna District (Unit M3): Approximately 50 acres in the Agricultural District in this unit have future development potential. The average land values range from $10,000 to $20,000 per acre, so the total land value in critical habitat ranges from $500,000 to $1 million.

— Ka‘u/South Kona District (Units O, P, Q, R, S, T, and V): Approximately 4,140 acres in the Agricultural District in this region have future development potential. The average land values range from $1,000 to $2,000 per acre, so the total land value in critical habitat ranges from $4.1 million to $8.3 million.

— North Kona District (Unit Y1): Approximately 187 acres in the Conservation District and 83 acres in the Agricultural District in this area have future development potential. The average land values range from $10,000 to $15,000 per acre for land in the Conservation District and $20,000 to $30,000 per acre for land in the Agricultural District, so the total land value in critical habitat ranges from $3.5 million to $5.3 million (187 * $10,000 + 83 * $20,000, 187 * $15,000 + 83 * $30,000).

Based on this information, the property value for all potentially developable land in critical habitat that is not currently planned for development ranges from $83.1 million to $164.5 million. In general, redistricting this land to the Conservation District will reduce the property value because it reduces the development potential. The difference between the value of land in the Conservation District and in the Agricultural District can be determined by looking at the market values of comparable parcels of land. However, there are no examples of lands in critical habitat that have been redistricted to the Conservation District. The combination of both redistricting and critical habitat may reduce property values below comparable parcels in the Conservation District that are outside of critical habitat (see section 4.f. below for further discussion on property values). As such, the reduction in property values associated with redistricting land in critical habitat is an undetermined but potentially large percentage of $83.1 million to $164.5 million.

Even if a landowner has no plans to sell the land, the loss in property value could reduce potential mortgage financing.

4.c.(9) Summary

In view of State law, there is a risk from a third-party lawsuit that designation of critical habitat could result in a redistricting of privately owned land in the Agricultural and Urban Districts to the Conservation District. It is possible that a lawsuit could force the redistricting of one or more parcels in critical habitat in the next 10 years. This precedent could be used to support additional redistricting lawsuits. Given the number of separate parcels in critical habitat, and the amount of legal opposition that would likely be raised by landowners, it unlikely that all of the parcels in

critical habitat will be redistricted in the next 10 years. However, it is also possible that a lawsuit will be filed to redistrict all of the parcels in critical habitat at one time. Since it is not known which parcels may be redistricted, or whether zero, some, or all of the parcels will be redistricted in the next 10 years, the economic cost if redistricting were to occur would be an undetermined percentage of $300 million to $400 million. This total worst-case scenario cost range comprises the following costs:

- Contesting Redistricting: $2 million
- Reduction in Agricultural Use of the Land: $500,000 to $19 million
- Loss of Development Due to Redistricting: $217 million to $219 million, consisting of:
  1. *State VOLA Master Planned Community*: Loss of $30 million in sunk costs and $4.8 million in social benefit of affordable housing
  2. *DHHL Housing Projects*: Loss of $5.8 million in benefit of DHHL housing
  3. *PIA Subdivision*: Loss of $8.3 million in sunk costs and $17 million in profits
  4. *Keahuolu Project*: Loss of $9 million to $11 million in sunk costs and roughly $100 million in profits, plus the political and social costs of (1) QLT not being able to provide care for Native Hawaiian orphans and destitute children, and (2) urban sprawl
  5. *Kohanaiki Business Park Expansion*: Loss of $12.2 million in sunk costs and profits
  6. *Kaloko Industrial Park Expansion*: Loss of $27.7 million in sunk costs and profits
- Reduction in Property Values Due to Redistricting: Undetermined but potentially large percentage of $83.1 million to $164.5 million

Some of these cost figures represent a loss to a specific entity that may be offset by a gain to another entity elsewhere in the regional economy. For example, the developer of the PIA subdivision will lose $17 million in profits if the houses can not be built in critical habitat. However, another developer outside of critical habitat may build additional homes and receive the same $17 million in profits. In this case, the net loss to the economy is zero, but the impacts are not distributed evenly.

Some of the costs are already invested in the land in critical habitat and cannot be recovered. For example, if development can not occur at the VOLA project site and the infrastructure cannot be used for another purpose, the $30 million in sunk costs will be lost.

Finally, some of the costs are intangible and can not be measured in economic terms. For example, the loss of potential QLT projects to provide aid to Native Hawaiian children will have significant social costs, but these costs can not be expressed in economic terms.

4.d. Conservation Management

Private and public landowners have expressed concern that they will be required to alter the management of their lands that fall within the designation so as to assure the survival and conservation of listed species, regardless of whether they plan to propose any changes to land uses or activities in the future. This concern stems in part from language in the proposed rule identifying overgrazing, the maintenance of feral ungulate levels, excess groundwater pumping, manipulation

of vegetation, residential and commercial development, and grazing of livestock or horses that degrades watershed values as activities that may directly or indirectly destroy or adversely modify critical habitat. (67 FR 37066). Specifically, some landowners are concerned that critical habitat designation could (1) require an end to grazing in critical habitat or (2) reduce or restrict the ability to draw water from existing water diversions on streams located within the proposed critical habitat.

Landowners have also expressed concern that, in addition to putting a halt to existing and planned activities, critical habitat designation could result in the imposition of new management obligations, such as the construction of fencing, the removal of feral ungulates, or the removal of noxious weeds. Some landowners have expressed concern that this new obligation will be expensive and they will have to pay most or all of the costs that may be associated with managing the land to assure survival and conservation of the species.

Finally, some landowners have expressed concern over the possible loss of discretion over their land management practices. Specifically, there is concern that beneficial land management practices voluntarily adopted in the past may become mandatory without regard to either the economic impact, the actual benefits associated with the practice, or the role of these management practices in their ongoing operations.

Discussed below are the existing and potential obligations under the Act associated with this type of land management, management activities that would enhance the survival and conservation of the plants, and the estimated costs of such management activities.

4.d.(1) Requirements for Conservation Land Management

Existing Federal Requirements

Section 7 of the Act by itself does not require landowners to manage their lands to protect critical habitat, assure the survival and conservation of listed species, or participate in projects to recover species for which critical habitat has been established. That is, critical habitat designation, by itself, does not require any landowner to: (1) create any reserve, refuge, or wilderness areas; (2) fence for any reason; (3) remove ungulates, rodents, or weeds; (4) close areas to hunters or hikers; (5) initiate conservation projects; or (6) prepare special land-management plans.

Instead, it requires only that a Federal agency that provides funding or permits for any activity that may affect the designated area must consult with the Service to insure that the activity is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species.

Existing State Requirements

Under existing State law, a Federal designation of critical habitat does not subject the land to additional State requirements to proactively manage the land to conserve listed species. In fact, the State endangered species law (HRS §195D), does not mention "critical habitat" although it does mention "habitat."

4.d.(2) Potential Future Requirements

Even though there is no direct requirement under Federal or State law to proactively manage lands to protect listed species and their habitats, some landowners speculate that, pursuant to litigation, a Federal or State court could mandate the cessation of existing activities and the institution of conservation management on privately owned critical habitat. Specifically, landowners fear the success of an argument similar to that used successfully in Federal Court to order the eradication of sheep and goats on Mauna Kea to protect the critical habitat of the endangered *palila* bird. (*Palila vs. Hawaii Department of Land and Natural Resources*). The *Palila* case was based upon section 9(a)(1) of the Act and found that modifying habitat could amount to a *take* of the species.

Potential Future Requirements: Endangered Species Act

Under Federal law, the prohibition on *taking* in the Act applies to fish and wildlife, but not to plants. Thus, it is arguable that the *Palila* decision is inapplicable to listed plants because that decision specifically addressed the Service's interpretation of the word *harm*, which is listed as a prohibited activity under the definition of *take*.

Still, an argument could be made that the reasoning underlying the *Palila* decision also applies to section 9(a)(2). Section 9(a)(2) of the Act makes it unlawful to "remove, cut, dig up, or damage or destroy any such (listed plant) species on any [land outside Federal jurisdiction] in knowing violation of any law or regulation of any State or in the course of any violation of a State criminal trespass law." Despite the presence of State law in Hawai'i protecting endangered or threatened plants, the prohibitions in section 9(a)(2) (against removing, cutting, digging up, damaging or destroying listed plants) are arguably narrower than the broader concept of *take* that was at issue in the *Palila* case. In addition to being limited to the removal, cutting, digging up, damage and destruction of a listed plant, a violation of section 9(a)(2) requires knowledge that the particular action violates State law. While a court could interpret this section broadly to prevent modification to critical habitat or require institution of conservation management activities, it is difficult to imagine a situation where an activity removes, cuts, digs up, damages or destroys a listed species in an area where the species is not present (i.e. an *unoccupied* area). Thus, the likelihood of this result is estimated to be low for purposes of this economic analysis.

In addition, it should be noted that an attempt to require conservation management in a particular area through litigation based on section 9(a)(2) could be brought with or without the designation of critical habitat. Any conservation management practices required as a result of such litigation would be section 9 costs, rather than section 7 costs. However, the boundaries of critical habitat could be used as a practical definition of the area that requires conservation management. As shown in Table I-1, approximately 81 percent of the proposed critical habitat is *unoccupied* by the listed plants. Thus, the designation of critical habitat may expand the area that would be subject to conservation management compared to a baseline scenario with no critical habitat designation. If this is the case, some undetermined percentage of the costs of conservation management would be attributable to critical habitat.

Potential Future Requirements: Interplay with State Law

Landowners also fear that conservation management may be imposed based on the interplay between provisions of State law and the designation of critical habitat. Under State law, the *taking* of any native threatened or endangered plant is prohibited. Landowners fear application of the

Federal definition of *take*, as applied in the *Palila* case, to the State Act. Moreover, because there is no critical habitat under State law, landowners fear that Federal designation of critical habitat would create the opportunity for this argument to be made under State law. In short, landowners fear that a court could find that an action that degrades Federal critical habitat constitutes an illegal *taking* under State law. For example, allowing ungulates, including cattle, to roam free could be viewed as an activity that degrades a critical habitat and therefore amounts to a *taking* under State law of a listed species.

However, the Service indicates that the State law prohibiting the *taking* of endangered or threatened plants is narrower than the Federal *take* provision for wildlife. Specifically, State law defines *take* as "to cut, collect, uproot, destroy, injure or possess endangered or threatened species of aquatic life of land plants." The word *harm*, upon which the *Palila* case relied, is not included in the State definition of *take* for plants.

Based on the above, while an argument is possible that the interplay between the designation of critical habitat and State law could mandate conservation management, the likelihood of this result is estimated to be low for purposes of this economic analysis. In addition, as discussed above, such an action could be brought without designation of critical habitat.

4.d.(3) Conservation Management to Protect Listed Plants

As indicated in the proposed rule, the major threats to native plants come from ungulates, combined with competition from non-native plants. In response to these and other threats, management actions needed to assure the survival and conservation of Hawai'i's listed species include: (1) feral ungulate control (e.g., strategic or barrier fencing to prevent or limit ungulates from migrating into large protected areas, exclosure fencing to prevent them from entering an area, extensive hunting and trapping to remove them from protected areas, one-way gates that allow animals to leave but not to enter an area, and monitoring transects for the presence of ungulates); (2) non-native plant control; (3) rodent control; (4) invertebrate pest control; (5) fire management; (6) maintenance of genetic material of the endangered and threatened plant species; (7) propagation, reintroduction and/or augmentation of existing populations into areas deemed essential for the conservation of species; (8) ongoing management of the wild, outplanted and augmented populations; and (9) habitat management and restoration in areas deemed essential for the conservation of species.

4.d.(4) Costs of Conservation Management Activities

The cost of implementing the above management actions would depend on the circumstances: the size of the area being managed, its location and access, the terrain, the quality of the native vegetation, ungulate populations, the extent of weeds, the risk of fire, land-management goals, etc. In addition, the costs arising from the halting of any existing activities would depend upon the nature of the activity, the availability of alternative locations to conduct the activity, and the cost of relocation.

The highest conservation management costs typically are incurred in the early years, with the most expensive items being fencing and removing ungulates. Depending upon location and terrain, the cost of fencing, including materials and installation, ranges from less than $30,000 per mile for areas that are accessible via a short drive, to as much as $170,000 per mile for remote locations that must be reached by helicopter (based on information from DLNR and NPS). Depending upon the circumstances, annual conservation-management costs range from an average

of less than $30 per acre to more than $80 per acre for remote wet habitat (based on information from DLNR, NPS, and private organizations). The proposed critical habitat for the plants covers over roughly 313,900 acres of this wetter higher elevation habitat. These figures are based on managing large, contiguous areas in the mountains; per-acre costs for managing small, dispersed areas could be significantly higher.

For rugged dry areas with gentle slopes and evidence of recent lava flows, conservation management activities will be different. Management of these areas would include fire, weed, slug, insect, and rodent control; ungulate exclosure fences; monitoring; and outplanting of native plants. In general, the cost per acre of these conservation management activities are inversely related the number of acres being protected. For example dry forest restoration projects on areas that are less than 100 acres at Kaʻupulehu on the Big Island have cost up to $5,000 per acre per year (Hawaiʻi Forest Industry Association, 1998). However, the Puʻu Waʻawaʻa management plan proposes to fence and manage 7,550 acres at a cost of $85 to $100 per acre per year (DLNR, 2002). The proposed critical habitat for the plants covers roughly 123,400 acres of this dry habitat, so the cost per acre of conservation management may be less than these figures. However, since individual units or portions of units may be fenced at a time, the conservation management costs for this dry habitat are likely to fall within the range of $85 to $100 per acre per year.

In addition to land-management costs, conservation of endangered plants (i.e., propagation, reintroduction and/or augmentation, fencing to protect from ungulates, monitoring, etc.) can be expensive. For example, a five-year effort to plant 25,000 silversword on Mauna Loa and Mauna Kea on the Big Island, which is regarded as being relatively straightforward and does not require weed control, is estimated at $1 million (estimate provided by DLNR, 2001).

Government cost-sharing programs are available to fund conservation projects (see Chapter IV), but current funding is inadequate to support such projects for all the lands in Hawaiʻi that are being proposed for critical habitat.

4.d.(5) Potential Cost of Conservation Land-Management Due to Critical Habitat

While the probability of a court mandating the institution of conservation management practices or the cessation of existing practices within critical habitat is estimated to be low, for the purposes of illustration of the potential costs involved, this section will assume that conservation management is mandated. For these purposes, the analysis will also assume that the conservation management is mandated for all of the proposed critical habitat on the drier regions of the Big Island (approximately 123,400 acres) and all of the proposed critical habitat in the remote wetter regions (approximately 313,900 acres).

Including all of the areas in critical habitat may overstate the total illustrative costs of conservation management, because some areas are already fenced and/or managed for conservation. These areas include the Puʻu Waʻawaʻa Wildlife Sanctuary, Kipuka ʻAlala and other areas on PTA, and areas managed on land owned by Kamehameha Schools. The critical habitat units are generally larger than these areas, so additional fencing may be required. In addition, these areas require annual funding for management. As such, they are included in the estimation of the conservation management costs.

If conservation management were mandated, the critical habitat proposal could cost landowners on the Big Island $19.9 million to $37.5 million per year, or $199 million to $375 million over 10 years (based on $85 to $100 per acre for dry areas and $30 to $80 per acre for wet

areas). Based on land ownership of these areas, about $6.6 million to $12.4 million per year would be a Federal obligation ($19.9 million * 33 percent; $37.5 million * 33 percent), about $10.1 million to $19.1 million per year would be a State and county obligation ($19.9 million * 51 percent; $37.5 million * 51 percent), and about $3.2 million to $6 million per year would be a private obligation ($19.9 million * 16 percent; $37.5 million * 16 percent). Importantly, to varying degrees, some of these lands are already managed as part of PTA, the National Park System, as NARs or as part of the Natural Areas Partnership program, or as part of the Pu‘u Wa‘awa‘a management plan (see Table I-1 and Chapter IV) and therefore these estimates likely overstate actual management costs. The related increase in economic activity is discussed in the section on benefits (Section 6).

4.d.(5)(a) Mandated Removal of Ungulates

If the required conservation management were to include removing ungulates, an additional loss could include the economic activity and benefits related to hunting. As discussed above, the 10- year economic impacts would include a loss of $13 million in direct sales, $23 million in total direct and indirect sales, $7.6 million in income, and $6.8 million in hunter benefits. Partially offsetting these loss would be economic activity generated by, and benefits derived from, activities that replace game-mammal hunting. Additional losses include the value of the hunting meat to the hunters and their families, as well as the social and cultural value of hunting to the community.

4.d.(5)(b) Mandated Cessation of Existing Agricultural Activities

If the required conservation management were to include cessation of existing ranching activities, an additional loss could include the economic activity related to ranching. As noted in the redistricting section above, when both direct and indirect sales and employment are considered, the total statewide loss amounts to about $1.9 million per year, or $19 million over 10 years (based economic multipliers from the Hawai‘i Input-Output Model). This economic activity supports roughly 56 jobs.

4.d.(5)(c) Mandated Cessation of Existing Water Diversions

If required conservation management were to include the reduction or prohibition on existing water diversions from streams within the proposed critical habitat, an additional loss would be anticipated that would include impacts on farming activities that utilize water from the existing diversions. The loss of all or a significant amount of the diverted water would be quite high, especially in light of the limited availability of other water sources.

However, the likelihood of changes to the existing water diversions based on critical habitat is very low or non-existent. First, the existing infrastructure constitutes existing man-made features that are found within the boundaries of critical habitat units but are not considered by the Service to be part of the proposed critical habitat (see Chapter I, Section 2.b). Second, the Service indicates that none of the listed plants are aquatic species that would be directly affected by water diversions. Finally, existing diversions in critical habitat have been in operation since 1915. Any plant communities that currently exist have adapted to the current water flow regime. Removing these existing diversions could threaten existing plant populations by increasing saturation in the soils. As such, the cessation of existing water diversions on the Big Island is unlikely to be a component of a mandated conservation management program.

4.d.(6) Conclusion

Private and public landowners have expressed concern that they will be required to alter the management of their lands that fall within the designation so as to assure the survival and conservation of listed species. As noted above, the probability of mandated conservation management is deemed to be low. However, if conservation management is mandated along with the cessation of certain activities in or adjacent to critical habitat, the costs to landowners, hunters, ranchers, and others would be significant. The 10-year costs would range from roughly $250 million to $430 million, including:

- Cost of Conservation Management: $199 million to $375 million in increased expenditures, some of which may be Federally funded
- Mandated Removal of Ungulates: Loss of $23 million in total direct and indirect sales, $7.6 million in income, and $6.8 million in hunter benefits plus the value of the hunting meat to the hunters and their families and the social and cultural value of hunting to the community
- Mandated Cessation of Existing Agricultural Activities: Loss of $19 million of direct and indirect output from ranching
- Mandated Cessation of Existing Water Diversions: None anticipated

4.e. State and County Development Approvals

4.e.(1) Concerns about Development Approvals

As discussed below, a major concern among private landowners, developers, and other interested parties is that critical habitat designations will significantly affect State and county development approvals, even when there is no *Federal involvement*. They are concerned that areas designated as critical habitat will be interpreted by government officials as "environmentally sensitive," and that this will result in increased difficulty in securing development approvals for both new projects and for improvements to existing structures. The argument against approvals would be that critical habitat must be protected, and development should be limited or not allowed within critical habitat boundaries.

Related concerns are that critical habitat will result in more expensive environmental studies, delayed projects, costly project modifications, increased risks of projects being denied and, for projects that are approved, the possibility of high legal fees to fight lawsuits designed to prevent or substantially alter projects.

The primary focus of the concern lies with potentially controversial projects that: (1) are in portions of the critical habitat that were not previously recognized as being environmentally sensitive because they contain no listed species, and (2) require major funding or discretionary approvals by the State or county. Discretionary approvals could include redistricting by the State Land Use Commission, approvals by BLNR for projects in the State's Conservation District, General Plan or Community Plan amendments by county councils, use permits from the county councils for activities within the Special Management Areas, etc.

4.e.(2) State and County Environmental Review

Based on discussions with planning consultants and government officials, critical habitat designations are likely to increase the scope of required environmental analysis. The reason for this

is that State and county agencies would require developers to address the impact of projects on critical habitat and related public concerns.

Subject to certain exemptions, a State Environmental Assessment (EA) or Environmental Impact Statement (EIS) is required for projects that: (1) use State or county lands or funds; (2) are in the Conservation District; (3) are in the Shoreline Setback Area (usually 40 feet inland from the certified shoreline); (4) require an amendment to a county plan that would designate land to some category other than Agriculture, Conservation or preservation; or (5) involve reclassification of State Conservation District lands. If a project "substantially affects a rare, threatened, or endangered species, or its habitat," then a State EIS might be required instead of the simpler and less expensive EA.

It is reasonable to assume that, although State law does not include the concept of critical habitat, the term "habitat" (which, in Hawai'i, includes areas that support listed threatened and endangered species) may eventually be interpreted by decision-makers to include "critical habitat" (which may include areas that could support listed species but presently do not). Those arguing in favor of this interpretation would include environmental groups, those who may oppose development, and possibly some government agencies. Eventually a developer may elect to, or be required to, submit a State EIS based on the fact that a project is located in a critical habitat. Once the precedent is set, succeeding developers may be required to submit State EISs under similar circumstances. Furthermore, a court may interpret "habitat" to include "critical habitat."

If critical habitat designation results in a requirement for a State EIS instead of an EA then, depending upon the complexity of the project, this could cost $25,000 to $75,000 more than an EA (based on estimates from Hawai'i planning firms). Also, preparing and processing a State EIS would take about two months longer than an EA. In addition, biological surveys could be required.

4.e.(3) Affected Projects and Increased Costs

Several projects and activities taking place within the proposed critical habitat that use State or county funds have already completed EISs (Saddle Road Project, Hapuna Beach State Recreation Area Expansion), or are exempt from requiring an EA (fire pre-suppression). However, eight other projects and activities in the proposed critical habitat may require an EA because they will use State or county funds or will take place in the Conservation District. These projects include two DHHL housing projects, three road projects, installing a water tank and constructing a trail at Pu'u Wa'awa'a, and drug enforcement raids. If all eight projects subsequently require EISs due to critical habitat, the additional cost to prepare them will be between $200,000 and $525,000 (8 x $25,000 and 8 x $75,000). Most of these projects will require a survey as part of a section 7 consultation or other environmental review, so survey costs are not presented here to avoid double- counting.

This estimate may overstate the costs attributable to critical habitat because some of the projects may require an EIS because they could affect listed plant individuals. However, since detailed surveys have not yet been completed for these projects, it is not known how many of the projects may affect listed plant individuals.

4.e.(4) Project Modification

If a proposed project requires major State or county approvals and is within critical habitat, developers are likely to be required by State and county agencies to request comments from the Service on the project. If the Service indicates that the project would have a negative impact on the

habitat of listed species, then State and county agencies probably would require project mitigation to address Service concerns. This would be expected even with no *Federal involvement*. The cost of the mitigation would depend upon the circumstances.

The eight projects mentioned above affect small areas, will require project modifications for listed species, and/or will require project modifications as part of a section 7 consultation. Thus, additional project modification costs for these projects are expected to be minor.

4.f. Reduced Property Values

4.f.(1) General Factors Underlying Reduced Property Values

An issue often raised by private landowners, and closely related to the above discussions, is that their property may lose value because of critical habitat designation. They are concerned that the designation will make their land less desirable by restricting its potential use or its development potential, or by increasing landowners' land-management or development costs.

The market value of a property reflects the future time-stream of economic and other benefits (e.g., profits) anticipated by potential buyers and sellers of land. Thus, factors which affect the future time-stream of benefits will affect the property values. For example, even partial approval of development can increase anticipated benefits and the timing of these benefits, thereby increasing property value. On the other hand, restrictions on land use, higher land-management costs, limits on development potential, higher development costs, and delayed development will adversely affect the anticipated stream of benefits, thereby reducing the property value.

Reduced property values may be based on facts and an accurate assessment of the implications of critical habitat. But even perceptions of the economic impact of critical habitat designation can result in a loss of property value if landowners or buyers believe that the designation will cause significant changes in the stream of benefits. Such a loss in property value will be experienced for as long as the perceptions persist.

Similarly, uncertainty about the impact of a critical habitat designation can cause a temporary reduction in land value that will continue until clear and correct information is distributed. To reduce the uncertainties, landowners may feel it necessary to retain counsel, land surveyors, biologists, and other experts to determine the implications of the designation on their property (see below). This can be particularly important for landowners who plan to sell their property and, therefore, must address concerns of potential buyers.

4.f.(2) Potentially Affected Properties and Impacts on Property Values

The concern of landowners about reduced property values primarily involves land that is: (1) privately owned; (2) in the State's Urban, Rural or Agricultural District; and (3) suitable for eventual development or commercial use based on access, gentle slopes, proximity to infrastructure and services, etc. It also includes some privately owned land in the Conservation District that has high value because of a high probability of being redistricted to the Agricultural or Urban Districts.

However, only a limited number of such properties are proposed for plant critical habitat designation. As indicated previously, much of the land is: (1) owned by government; (2) in the Conservation District; and (3) not suitable for development because it is in areas that have poor access and difficult terrain (e.g., lava flows).

Lands that would be at risk of a significant loss in land value include those previously mentioned in the redistricting section above: about 12,400 acres of privately owned agricultural land and about 83 acres of urban land. As discussed previously, redistricting agricultural and urban land to the Conservation District could reduce land values by over $83.1 million to $164.5 million.

However, this estimate does not include potential property value reductions to private lands that are currently planned for development. The land values associated with these planned developments include:

— PIA Subdivision (Unit Z): Approximately 840 acres in the Agricultural District are in critical habitat. The average land values in this region range from $10,000 to $20,000 per acre, so the total land value in critical habitat ranges from $8.4 million to $16.8 million.

— Keahuolu Project (Unit Y2): Approximately 344 acres in the Urban District are in critical habitat. A preliminary assessment of the impact of proposed critical habitat on the market value of this project estimates that the value of the property in critical habitat is $18.4 million. This assessment also states that critical habitat will cause a reduction in the land value to $170,000, or a reduction of $18.2 million (John Child & Company, 2002).

— Kohanaiki Business Park Expansion (Unit Y1): Approximately 40 acres in the Urban District are included or affected by critical habitat. The assessed land value for this parcel is $40,000 per acre, so the total land value in critical habitat $1.6 million.

— Kaloko Industrial Park Expansion (Unit Y1): Approximately 85 acres in the Urban District are included or affected by critical habitat. The assessed land value for similar land in this area is $40,000 per acre, so the total land value in critical habitat $3.4 million.

Including both the property value for private land that is not currently planned for development ($83.1 million to $164.5 million), and the land that is currently planned for development ($31.8 million to $40.2 million), the total value of the property that could be affected by critical habitat ranges from $115 million to $205 million.

Based on just the section 7 consultation requirements, any decrease in property value due to critical habitat designation is expected to be small—at least in theory and assuming fully informed buyers and sellers. The reason for this is that few projects and activities in these areas would be subject to consultations, and project modifications are not expected to be burdensome. Nevertheless, perceptions could contribute to a more significant reduction in property values.

However, the greatest loss in land value would be due to the perceived risk of State redistricting of Agricultural and Urban land to the Conservation District as discussed above. Furthermore, this loss in value will remain until a State court decides whether land designated as critical habitat should be redistricted to Conservation. Because there is little experience in Hawai‘i with critical habitat, however, information to accurately estimate the actual loss in value does not exist—there are no comparables in Hawai‘i on which to base a loss in value, and mainland comparables do not apply because of different state environmental and land-use laws.

Thus, the actual loss in land value due to critical habitat and the perceived loss in development potential would be some undetermined fraction of the $115 million to $205 million mentioned above. Based on discussions with landowners and land appraisers, the loss could be significant—at least until more experience is gained with critical habitat or until the issue is resolved in court.

4.g. Subsistence and Native Hawaiian Traditional and Cultural Practices

Another concern expressed is the effect of critical habitat designation on Native Hawaiian traditional and cultural practices, including subsistence activities. Specifically, there is concern that designation of critical habitat may interfere with or restrict the practice of subsistence and other traditional and cultural practices.

4.g.(1) Subsistence and Native Hawaiian Rights

The Hawai‘i State Constitution, Chapter 12, Section 7 reads:

> "The State reaffirms and shall protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua‘a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778 subject to right of the State to regulate such rights."

As indicated by this constitutional provision, subsistence and Native Hawaiian rights are closely tied. In early Native Hawaiian life, gathering activities supplemented the cultivated food and medicinal staples of the people, helped people survive in times of famine, and allowed tenants to retrieve large amounts of a product for a communal purpose, such as a tree for a canoe.

While Hawai‘i’s subsistence economy drastically changed with the changes in the land tenure system, Native Hawaiian traditional rights of access and gathering, for subsistence or other purposes, were not extinguished by the exclusivity traditionally associated with fee simple ownership of the land. (*Kalipi v. Hawaiian Trust Co.,* 66 Haw. 1, 656 P.2d 745 (1982); *Public Access Shoreline Hawai‘i (PASH) v. Hawai‘i County Planning Commission*, 79 Haw. 425, 450 (1995), cert. denied, 517 U.S. 1163 (1996)). However, access is guaranteed only in connection with undeveloped lands, and while the Hawai‘i Supreme Court has ruled that the State Constitution does not prevent development by landowners, the point at which land becomes sufficiently developed to where it is inconsistent to allow or enforce the practice of traditional Hawaiian gathering rights on such property remains undecided. (*PASH*, 79 Haw. at 450).

Defined narrowly, subsistence consists of the non-commercial and non-recreational harvest of fish, game, marine mammals, plants and other products of the land for personal or communal use. The subsistence lifestyle also includes the processing of these products for food, clothing and other uses as well as sharing or exchanging these products with others in the community. Defined more broadly, subsistence includes a lifestyle choice. For some Native Hawaiians, subsistence is central to their culture and way of life.

4.g.(2) Practice of Subsistence Within Proposed Critical Habitat

Studies of contemporary subsistence in Hawai‘i have documented subsistence practices and formulated conceptual plans for communities on Hawai‘i, Moloka‘i, Maui, and O‘ahu.

Subsistence can play an important role in community life, including:

- Providing families with essential resources that compensate for low income.
- Preserving traditional Hawaiian cultural values, customs and practices as cultural knowledge. Place names, fishing *ko'a* (shrines), methods of fishing and gathering, and the reproductive cycles of marine and land resources have been passed down from one generation to the next through training in subsistence skills.
- Providing a link to the traditions and ways of life of previous generations - to the ways of the *kupuna* (elders) and the previous occupants of the land.
- Providing a basis for sharing and gift-giving within the community and reinforces good relations among members of extended families and neighbors.
- Allowing family members of all ages to contribute to family welfare.
- Fostering conservation because traditional subsistence practitioners are governed by particular codes of conduct intended to ensure the future availability of natural resources.
- Providing a valuable, but relatively inexpensive, form of exercise and stress reduction.
- Increasing the time spent in nature, cultivating a strong sense of environmental kinship.

(Moloka'i Subsistence Task Force: Final Report 1994).

Preserving the practice of subsistence is of particular importance in Pu'u Wa'awa'a (Unit Z) and in the Forest Reserves in critical habitat (see Table I-1). The Draft Management Plan for the Ahupua'a of Pu'u Wa'awa'a and the Makai Lands of Pu'u Anahulu (2002) specifically recognizes prior gathering activities by Native Hawaiians and lists "establish protocol for sustainable traditional and cultural gathering" as an objective for the future management of the area. Anticipated future subsistence activities within the proposed critical habitat include hunting, forest gathering, stream gathering, fishing and ocean gathering.

4.g.(3) Economic Valuation of Subsistence Activities

As noted earlier in Section 4.d, the possibility exists that a Federal or State court could mandate conservation management of critical habitat based on the interplay between the Act and State requirements, which could involve activities such as fencing or ungulate removal that might reduce the ability of Native Hawaiians to practice subsistence activities in these areas. In addition, the State or private landowners could adopt a policy of restricting access into areas that overlap critical habitat units without a judicial mandate as a conservative measure to protect critical habitat. The resulting economic impact under either scenario is difficult to estimate, as discussed below.[16]

The total economic value of subsistence is the total amount that subsistence participants and others would be willing to pay to engage in subsistence activities independent of whether they actually pay that amount. While it is possible to measure this total value for recreational activities

[16] This analysis borrows from *Economic Assessment of Bristol Bay Area National Wildlife Refuges: Alaska Peninsula/Becharof Izembek Togiak Final Draft*, prepared by the Institute of Social and Economic Research and Industrial Economics, Incorporated, for the Service in December 1998.

like fishing, the discussion below describes why typical methods of estimating economic value do not work when applied to subsistence.

One method for measuring willingness to pay, contingent valuation, is based on asking people how much they would be willing to pay to engage in subsistence, or how much they would need to be compensated to stop engaging in subsistence. To Native Hawaiians who consider subsistence to be a right or way of life, such questions have no meaning. In addition, some Native Hawaiians involved in the subsistence lifestyle have modest incomes and may be considered economically disadvantaged compared to other groups when responding to questions involving relative values based on monetary income.

The other commonly used method, known as travel cost, would estimate the value of subsistence by observing how often people visit sites at different distances with different characteristics. The value of difference sites to subsistence participants may be estimated by observing how the number of visits to different sites declined as the distance to the site increased. In theory, this method could determine the net economic value of subsistence activities in specific locations and thus be used to value the use of proposed critical habitat for subsistence activities. The practical difficulties in conducting such a study make it virtually impossible to conduct, and no such studies have ever been done.

One way to portray the importance of subsistence activities, a large share of which are for the collection and preparation of food, is by calculating the nutritional value of the products of the harvest. However, while it is known that food derived from subsistence activities makes up a portion of the diet of those practicing subsistence, the number of families practicing subsistence within the proposed critical habitat, the total nutritional value gained through subsistence, and the proportion of food derived from subsistence activities conducted in the proposed critical habitat (as opposed to outside the proposed critical habitat) is unknown.

Another way to portray the importance of subsistence activities is to use replacement cost to estimate its value. Replacement cost is defined as the market prices of the food and other commodities obtained through subsistence. The net value of subsistence would then be calculated by subtracting out the costs of engaging in subsistence. But replacement cost is an inappropriate measure of the total economic value of subsistence because it produces an underestimate of total economic value by not including the value associated with the activity of subsistence itself, independent of its product. For many different reasons, people engaged in subsistence value the experience independent of the harvest. For example, many people who are engaged in subsistence value the experience for the opportunity to share cultural knowledge with younger generations and for the connection with nature.

Because replacement cost underestimates the total economic value of subsistence activities, it is best to avoid its use altogether. Not only is the underestimation likely to be considerable, but its use also validates and perpetuates the idea that the total value of subsistence lies in the market value of its products. In addition, there are practical difficulties in determining the replacement cost of many subsistence products that are not found in the grocery store.

However, the products of subsistence do represent income-in-kind to the residents of these communities. When measuring the economic well-being of residents of the Big Island, it is necessary to include not only money income, but also the monetary value for any goods or services that the residents receive, which is known as income-in-kind. Typical examples of income- in-kind are the rental value of owner occupied housing and the value of products produced and consumed

on family farms. Typically a value is placed on these goods and services based on observed prices in markets for these products. Estimation of this income-in-kind shows both the market value of the products harvested and the importance of these products as a source of income to the residents. For this calculation the use of replacement cost could be appropriate. However, without information on the amount of subsistence harvest, it is not possible to provide estimates.

4.g.(4) Potential Impact on Subsistence and Native Hawaiian Traditional and Cultural Activities Due to Critical Habitat

The value of subsistence activities to the residents of the Big Island is difficult to quantify because of the lack of information on the amount of the subsistence harvest. Further, the impact of a worst-case scenario that restricts access and prohibits subsistence activities in all areas proposed for critical habitat designation is complicated by the fact that subsistence activities occurs in areas outside the proposed critical habitat. The relative importance of the areas located within critical habitat versus those outside the proposed critical habitat is not documented. Presumably, a restriction in access would result in subsistence practitioners switching to locations outside the proposed critical habitat.

However, such a switch would have an impact. Clearly, subsistence fishing, ocean gathering, hunting, and forest and stream gathering, play an important role in the cultural and social framework of the community. The cultural aspect of subsistence does place value on the location where the activity is conducted. In addition, the areas within the proposed critical habitat used for subsistence activity may have greater importance than their size may indicate. For example, an area within the proposed critical habitat may be the only location on the island to collect a certain plant used for medicine. As such, there could be a significant, though undetermined, loss associated with restriction of subsistence activities in the proposed critical habitat.

However, the probability of the worst-case scenario, resulting in the restriction of access and prohibition of subsistence activities in all areas proposed for critical habitat designation is undetermined, but is unlikely. More likely to occur are restrictions in small, localized areas of significant biological importance – typically because of the presence of listed plants. Because of the strong stewardship and conservation values associated with those practicing subsistence activities within the proposed critical habitat, as well as the traditional recognition of the value of protecting certain areas through the *kapu* system, it is likely that subsistence activities would be consistent with conservation restrictions, particularly in localized areas. Thus, it is anticipated that the impact of critical habitat designation on subsistence activities will be minimal.

4.h. Military Readiness

As noted in the direct costs section above, critical habitat Unit AA covers almost 93 percent of the existing area available for maneuvers and special uses at PTA. The Army is concerned that critical habitat will increase the probability of a successful third-party lawsuit to limit or stop training activities in critical habitat. For example, a court may determine that planned off-road vehicular use in critical habitat degrades the value of the critical habitat and cannot be conducted at PTA. The probability that a lawsuit will be filed and will be successful is undetermined, but the costs of the result of such a lawsuit are presented for illustrative purposes. These costs on the Big Island would be expressed in terms of lost Federal military funds in Hawai‘i and a loss of the use of a unique and strategic training area.

The Army has proposed to transform the 25th Infantry Division (Light) at Schofield Barracks into one of several nationwide Interim Brigade Combat Teams (IBCT). In order to support the IBCT, the Army is planning a series of 32 construction projects on O'ahu and at PTA. The Army also plans to use PTA for off-road vehicular maneuvers. Due to its size and location, PTA is the only range in Hawai'i where certain activities necessary for the training the IBCT can take place. If a lawsuit makes PTA unavailable for these training activities, the Army may chose to transform a division in another State into the IBCT. The Army plans to spend $693 million in direct construction costs in Hawai'i to support transformation. These Federal funds will be lost to Hawai'i if the Army does not continue with current transformation plans (Army, 2002).

Current activities at PTA may also be affected by a third-party lawsuit. PTA is a unique and a valuable training area in Hawai'i for the following reasons:

- It functions as the destination point for frequent air mobility exercises.
- It can accommodate two infantry battalions simultaneously.
- It is the only location in the State which can support combined air/ground live-fire exercises.
- All weapons system munitions can be fired at a maximum range with a broad firing corridor. The ranges on O'ahu provide only a narrow corridor and no depth for artillery.

If a third-party lawsuit compromises the utilization of these unique and valuable attributes of PTA, the military in Hawai'i will have to alter its training activities. For example, the Army may have to transport troops to less constrained training areas in Alaska or the contiguous United States. The average round trip cost of transporting one battalion by air and ship from Hawai'i to Fort Lewis, Washington is estimated at approximately $1.1 million (Onyx 2001). The time and costs associated with the transport may make this option unattractive as a long term solution. Instead, the Army and other military branches may withdraw their presence in Hawai'i. This would happen over many years and would be caused by a series of factors in addition to lawsuits related to critical habitat. However, the economic costs to Hawai'i would be significant. For example, the Army spent $677 million on payroll, $249 million in contracts, and $690 million on supplies, equipment and services in Hawai'i in fiscal year 2001. The loss of the Army's presence in Hawai'i could also affect national security due to Hawai'i's strategic location in the center of the Pacific theater.

4.i. Condemnation of Property

Some landowners suspect that, following critical habitat designation, the Service eventually will condemn private property at depressed property values. However, the Service is not proposing nor is it contemplating purchasing any land being proposed for critical habitat designation.

On occasion, the Service does purchase land (e.g., land for a wildlife refuge). But this would be a separate action from critical habitat designation. As such, any proposed land purchase should be evaluated at the time it is proposed, and should be based on what is actually proposed. When the Service does purchase private property, the normal practice is to do so only when (1) the landowner is willing to sell the land, and (2) the price and other terms are acceptable to the landowner.

4.j. Costs to Investigate Implications of Critical Habitat

Many of the private landowners may hire attorneys or use their own professional staff to investigate the implications of critical habitat designation on their property. They may want to learn

how the designation may affect (1) the use of their land (either through restrictions or new obligations), and (2) the value of their land.

A total of 84 private landowners are included in the proposed critical habitat designation Many of these landowners control small parcels, less than 10 acres in size, within the proposed critical habitat designation. While a few of these landowners may be familiar with the Act, this analysis assumes that all of them will investigate the potential impacts on their properties.

An estimate of the costs involved with this investigation ranges from roughly $273,000 to $798,000. This estimate is based on the following assumptions: (1) 84 landowners will investigate the implications of critical habitat; (2) the landowner and/or the landowner's attorneys or professional staff will spend about 15 to 40 hours on the investigation at rates of $150 to $200 per hour; and (3) Service staff will spend four to 10 hours at $100 to $150 per hour responding to inquiries from each landowner.

4.k. Loss of Conservation Projects

Some parties have expressed concern that the ongoing activities of the Service to designate critical habitat will cause some landowners to decide not to engage in conservation projects with the Service, NRCS, and/or DLNR. Landowners may reduce participation in these projects to avoid *Federal involvement* over their land management practices, out of concern that participation in conservation projects within critical habitat may result in project modifications that expand the project and increase the cost or that shift the focus of the project away from the landowner's initial intent.

The loss of conservation projects which, in fact, has occurred in the State of Hawai‘i on occasion, may include refusal to allow biological surveys of their land, or refusal to participate in watershed and conservation partnership programs sponsored by the Service, NRCS and DLNR. It may also involve ceasing participation in existing conservation projects. Reduced cooperation could result in lower-quality land management, environmental degradation, and increased risks to native plants and wildlife, including the listed plants. If the environmental changes were valued, they could reflect an economic loss to society.

In addition, several large private landowners employ staff to oversee their natural resources management and their participation in conservation projects. Reduced cooperation in these projects could result in these positions being eliminated.

Any change from the current level of cooperation from landowners will depend on how much land is designated, which land is designated, actual and perceived restrictions on land use and development due to the designations, and perceived risks in the future. The assessment would be based on experiences in Hawai‘i as well as in other states.

For the plants, the proposed critical habitat designation is expected to have a modest impact on land use and development over and above existing restrictions. This is especially true for land in the Conservation District, which accounts for 84 percent of the proposed critical habitat. As landowners gain experience with the actual effects of critical habitat, their concerns about whether or not to cooperate on conservation projects may diminish.

Nevertheless, the proposed area is relatively significant—amounting to 17 percent of the Big Island—and includes large amounts of privately owned land in the Agricultural District. As a result,

a modest but undetermined reduction in cooperation may occur, along with a corresponding but undetermined environmental loss to society.

5. COSTS TO SMALL ENTITIES

5.a. Regulatory Flexibility Act

Under the Regulatory Flexibility Act (RFA) (as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever a Federal agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities.

SBREFA amended the RFA to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities.

While SBREFA does not explicitly define either "substantial number" or "significant economic impact," the U.S. Small Business Administration (SBA) and other Federal agencies have interpreted "substantial number" to mean 20 percent or more of the small entities in any industry, and "significant economic impact" to equal three percent or more of a business's annual sales.

Federal courts and Congress have indicated that an RFA/SBREFA analysis should be limited to all impacts to entities directly subject to the requirements of the regulation (Service, 2002). As such, entities indirectly impacted by the plant listings and critical habitat and, therefore, not directly regulated by the listing or critical habitat designation are not considered in this section of the analysis.

5.b. Entities Potentially Impacted

The analysis is based on a review of all previously discussed projects, activities, land uses and entities that may be directly affected by the implementation of section 7 for the listed plants. Based on this review, the following entities will be directly impacted (projects, activities, and land uses are noted in parentheses):

Federal:

- Service (All projects, activities, land uses)
- NPS (Hawai'i Volcanoes National Park conservation activities and expansion, funding TNCH and other conservation projects, fire suppression activities)
- HUD (Loan programs for DHHL projects)
- FSA (FSA farm loan programs, USDA conservation programs, FSA disaster relief programs)
- NRCS (USDA conservation projects, funding construction of non-potable water systems)
- FHWA (Funding construction of new roads and trails)
- MTMC (Funding construction of new roads)

— FCC and/or FAA (Permitting communications facilities)
— FEMA (Funding natural disaster recovery)
— U.S. Forest Service (Funding fire management activities)
— DEA (Illegal drug control)
— Army (Military training exercises, fire suppression activities)
— Navy (Military training exercises)
— Marines (Military training exercises)
— Air Force (Military training exercises)
— Other Federal Agencies, not yet identified (funding TNCH and other conservation activities)

State:

— DLNR (Game management, trail construction, conservation activities and improvements in State managed areas, non-potable water system improvements, fire management, illegal drug enforcement)
— Hawai‘i Army National Guard (Military training exercises)
— HDOT (Constructing new roads)

County:

— Hawai‘i County DPW (Constructing new roads)

Non-profit:

— TNCH (Conservation activities)
— Kamehameha Schools (Constructing new communications facilities)

Private:

— Lending institutions on the Big Island (Loans for residential development)
— Native Hawaiian lessees (Participating in residential loan programs)
— Farmers or Ranchers (Participating in farm loan programs)
— Verizon (Constructing new communications facilities)
— HELCO (Constructing new communications facilities)
— Chronicle Publishing Company (Constructing new communications facilities)

5.c. Small Entities Potentially Impacted

The RFA/SBREFA considers “small entities” to include small governments, small organizations, and small businesses (5 U.S.C. §601). The following discussion examines each entity potentially impacted from the list above to determine whether it would be considered “small” under the RFA/SBREFA.

5.c.(1) Federal Agencies

For the purposes of the RFA/SBREFA, Federal agencies are not considered small governments. As such, the Service, NPS, HUD, FSA, NRCS, FWHA, MTMC, FCC, FAA, FEMA,

U.S. Forest Service, DEA, Army, Navy, Marines, Air Force, and other Federal agencies are not considered further in this portion of the economic analysis.

5.c.(2) State Agencies

For the purposes of the RFA/SBREFA, State governments are not considered small government jurisdictions. As such, the DLNR, Hawai‘i Army National Guard, and HDOT are not considered further in this portion of the economic analysis.

5.c.(3) County Agencies

The RFA/SBREFA defines "small governmental jurisdiction" as the government of a city, county, town, school district, or special district with a population of less than 50,000. Hawai‘i County has a population greater than 50,000 (see Chapter II). As such, county agencies such as the Hawai‘i County DPW are not considered further in this portion of the economic analysis.

5.c.(4) Non-Profit

The RFA/SBREFA defines “small organization” as any not-for-profit enterprise which is independently owned and operated and is not dominant in its field. TNCH is a large organization that is dominant in the conservation and land management field on the Big Island. According to the RFA/SBREFA definitions, TNCH is <u>not</u> likely to be considered a small organization.

Kamehameha Schools is the largest charitable trust in Hawai‘i, as well as the State’s largest private landowner; it also has a substantial investment in securities and owns real estate in other states. In 2001, Kamehameha Schools had over $1 billion in revenues, gains, and other support (Kamehameha Schools, 2001). Thus, it is <u>not</u> likely to be considered a small organization.

5.c.(5) Private

Lending institutions may be involved in up to 14 consultations regarding HUD residential loan programs for homes in the proposed critical habitat. These lending institutions must be approved by the Federal Housing Administration (FHA) in order to participate in the HUD loan programs. Most of the approved lending institutions doing business on the Big Island are branches of financial institutions that operate statewide, nationally, or internationally and are not small businesses. However, it is possible that two or three of the FHA approved lending institutions involved in section 7 consultations <u>will</u> be small according to the SBA definition (i.e., less than $6 million in annual sales).

Native Hawaiian lessees may also be involved in consultations regarding HUD residential loan programs. However, private individuals are not included in the RFA/SBREFA definition of a small entity. As such, Native Hawaiian lessees are not considered further in this portion of the economic analysis.

Five farmers or ranchers may be involved in a consultation regarding the FSA farm loan program. FSA farm loans are only available to farmers and ranchers who are temporarily unable to obtain private, commercial credit. This will tend to screen out the larger farmers and ranchers in critical habitat. Based on location and climate, the farmers in critical habitat are likely to grow fruits, flowers, or other diversified crops. The SBA defines a diversified farmer or a rancher as small if its annual sales are less than $750,000. Based on annual sales figures for diversified farmers

and ranchers on the Big Island (see section 5.d.(2) below), it is assumed that the five farmers or ranchers will be small businesses.

Verizon is a subsidiary of Verizon Communications Inc., an international communications company. The SBA defines a communications company as small if it has fewer than 1,500 employees. Verizon Communications Inc. currently has 260,000 employees, so it is not a small business (Verizon, 2002).

HELCO is a subsidiary of Hawaiian Electric Industries, Inc. (HEI). HEI is the largest Hawai'i-based company, providing electric utility services to 95 percent of Hawai'i's residents. HEI also owns the State's third largest bank. The SBA defines an electric utility as small if, including its affiliates, its total electric output for the preceding fiscal year did not exceed 4 million megawatt hours. HEI's affiliates generated 9.4 million megawatt hours in 2001, so it is not a small business (HEI, 2002)

Chronicle Publishing Company is a subsidiary of the Chronicle Publishing Company in San Francisco, California. The parent company is primarily involved in publishing newspapers and books, and television broadcasting. The SBA defines a newspaper or book publisher as small if it has fewer than 500 employees and it defines a television broadcasting company as small if its annual sales are less than $12 million. Based on the number of employees and the annual sales, the Chronicle Publishing Company is not a small business (Dun & Bradstreet, 2002).

5.d. Potential Impacts on Small Entities

The small or potentially small entities that may be impacted by the plants listing and critical habitat designation are two to three lending institutions and five farmers or ranchers.

5.d.(1) Lending Institutions

Between two and three small lending institutions on the Big Island may be involved in a section 7 consultation regarding HUD loan programs. Based on the estimates provided in Table VI-1 and Table VI-2, participation in the consultation will cost $1,400 and conducting the biological survey will cost $3,900, so the total impact will be $5,300 per lending institution.

The average annual revenues for the two to three small lending institutions is unknown. If they each earn less than $176,700 in annual sales ($5,300 divided by three percent), the economic impact attributable to critical habitat would be a significant economic impact to the lending institutions (i.e., greater than three percent of annual sales).

There are currently 26 mortgage lending institutions on the Big Island. Of these, 23 meet the SBA definition of a small business (i.e., less that $6 million in annual sales)(Dun & Bradstreet, 2002). Two to three lending institutions out of 23 (nine to 13 percent) will potentially be subject to a significant economic impact. This does not equal a substantial number (i.e., 20 percent) of the small lending institutions on the Big Island.

5.d.(2) Farming and Ranching

Five farmers or ranchers may be involved in section 7 consultations regarding FSA farm loans. Based on the estimates provided in Table VI-1 and Table VI-2, participation in the consultations will cost between $1,400 and $4,200 and conducting the biological survey will cost

$4,500, so the total economic impact will be $5,900 to $8,700 per farmer or rancher. Project modifications associated with these consultations are expected to be minor.

The 2000 average annual sales for diversified farmers on the Big Island are $59,600 per farmer, and the average annual sales for ranchers is $30,100 per rancher (DBEDT, 2002). Since $8,700 is 15 percent of the average annual sales for a diversified farmer and 29 percent of the average annual sales for a rancher, it is assumed that critical habitat will have a significant economic impact (i.e., three percent or more of a business's annual sales) on the farmers or ranchers.

However, there are 1,400 diversified farmers and 470 ranchers on the Big Island. Based on the annual sales figures mentioned in the proceeding paragraph, most of these farmers and ranchers are small businesses (i.e., less than $750,000 in annual sales). Five farmers or ranchers represent 0.3 percent of the number diversified farmers and one percent of the number of ranchers on the Big Island. This does not equal a substantial number (i.e., 20 percent) of the small businesses in either the diversified farming or ranching industries.

5.d.(3) Summary

Based on the analysis above, implementation of the Act's section 7 provisions for the plants may have a significant economic impact on two to three small lending institutions and five farmers and ranchers. However, these entities do not represent a substantial number of the small entities in their respective fields or industries. Therefore, the plants critical habitat designation will not have a significant economic impact on a substantial number of small entities.

6. SECTION 7-RELATED ECONOMIC BENEFITS

6.a. Introduction

Critical habitat designation is likely to provide economic benefits to the region, as well as to society as a whole. These benefits fall into two categories. Direct benefits are those directly attributable to the activities associated with compliance with the habitat designation, while indirect benefits arise from preservation of threatened and endangered species and other environmental improvements encouraged by critical habitat designation. Direct and indirect economic benefits may be manifested in two ways: changes in regional economic activity and changes in social welfare.

Regional economic and social welfare measures represent alternate ways to view the benefits of critical habitat designation. Regional economic benefits refer to an increase in revenues or employment in a given area. Changes in regional economic activity are an important aspect of policy and project evaluation because the costs of certain actions may be more concentrated among regional residents than are the benefits. From a national perspective, however, increases in activity in the region reflect a redistribution of activity from another geographic area, not a net increase in national economic activity. The exception is inflow from non-domestic sources.

"Social welfare benefits" are measured by individuals' "willingness to pay." The sum of an individual's willingness to pay for something, net of the costs associated with its consumption, is referred to as consumer surplus. Consumer surplus is the standard metric used to evaluate alternate allocations of society's resources, as in cost-benefit analysis of environmental programs. While one might argue that local residents are the primary beneficiaries, welfare benefits associated with critical habitat designation, to the extent that it enhances the nation's stock of natural assets, flow to society at large.

However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the scarcity of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the endangered plants will be present in the area); and 2) quantified data on the value of the Big Island species. As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Thus, categories of benefits are discussed in qualitative terms. It is not intended to provide a comprehensive analysis of the benefits that could result from section 7 of the Act in general, or of critical habitat designation in particular. In short, the Service believes that the benefits of critical habitat designation are best expressed in biological terms that can be weighed against the expected costs of the rulemaking.

6.b. Direct Benefits

6.b.(1) Regional Economic Benefits

Regional Economic Activity Associated with Medical/Pharmaceutical Benefits

Many of the threatened and endangered plant species have ethnobotanical value to the Native Hawaiians. While it is possible that some of the listed plants have an undiscovered medicinal value, there is no way to determine the statistical probability of this occurrence or the economic value of an as-yet undiscovered medicinal use. Moreover, there is significant uncertainty regarding the contribution critical habitat designation has to the conservation of that as-yet unspecified plant.

Regional Economic Activity Generated by Conservation Management

In FY 2001, the Service spent an estimated $441,650 on conservation management for listed plants in the Big Island, including expenditures on salaries, equipment, supplies and services. In turn, workers and companies that benefitted from the Service's expenditures on conservation management purchased additional goods and services, thereby generating additional economic activity (referred to as the multiplier effect). In total, the initial Service expenditure generated approximately $794,970 in direct and indirect sales for the year on the Big Island and other islands, and supported about 10 jobs in Hawai'i (based on multipliers from the Hawai'i Input-Output Model, DBEDT, 1998).[17] The State and other organizations also spend a considerable amount on

[17] The Hawai'i Input-Output Model is an economic forecasting tool that can be used to estimate the "ripple effect" of changes in regional expenditures. That is, as dollars are spent in or withdrawn from a particular sector of the economy, not only is that sector affected directly but also the other sectors that supply goods and services to it are affected indirectly. The magnitude of this "ripple effect" is captured by estimates known as "multipliers". For example, a multiplier of two indicates that $1 worth of expenditures in a particular sector is responsible for an overall contribution of $2 to the local economy. It is important to note that "direct" and "indirect" in the context of input- output modeling refer to primary and secondary changes in sales and employment associated with expenditures. They do not, in this context, distinguish direct from indirect costs or benefits, as discussed in the introduction.

conservation management that involves listed plants in the Big Island (e.g., State expenditures to manage NARs).

If the proposed critical habitat results in an increase in conservation management activities in the Big Island, associated expenditures may increase economic activity in Hawai‘i. The amount of future increase in conservation management activities is speculative. However, based on State multipliers, each additional $1 million spent in Hawai‘i would generate approximately $1.8 million in direct and indirect sales in Hawai‘i, and would support approximately 22 direct and indirect jobs.

If all of the proposed critical habitat in the Big Island were to be managed for conservation, which is not expected unless mandated by a court order, then the resulting expenditure would be about $19.9 million to $37.5 million per year. This estimate assumes that the conservation management would involve an average cost of $85 to $100 per acre for dry areas and $30 to $80 per acre for wet areas of the proposed critical habitat (of the total proposed critical habitat, about 313,900 acres are in wet areas and 123,400 acres in dry areas). This would generate roughly $35.8 million to $67.5 million per year in direct and indirect sales in Hawai‘i, or $358 million to $675 million over 10 years. This economic activity would support about 438 to 825 direct and indirect jobs.

It is important to note, however, that expansion of Hawai‘i’s economy through these expenditures is contingent upon how they are financed. If the increase in conservation management is financed by an influx of new funds from outside the State, then the increase in expenditures will contribute to increased economic activity in Hawai‘i. New funding for conservation management could come from the Federal government, grants from non-profit organizations outside Hawai‘i, or other sources. While this is possible, no known projections are available that indicate a significant increase in funding for conservation management from outside Hawai‘i due to the proposed critical habitat designation.

If increased expenditures on conservation management are funded from within Hawai‘i, or through funds from outside sources already intended for use in the State, there would be no significant change in economic activity. Similarly, as discussed in the introduction, increased funding of conservation programs in Hawai‘i would result in no significant change in economic activity for the economy as a whole because any funds spent in Hawai‘i would be at the expense of expenditures elsewhere (e.g., funds diverted from some other Federal program).

Regional Economic Activity Generated by Project Modifications

As mentioned in the direct costs section above, section 7 consultations on certain projects and activities in critical habitat can result in project modifications. The expenditures associated with these project modifications may increase economic activity in Hawai‘i. Certain project modifications will be financed by through private, county or State funds. These would not result in a significant change in economic activity for the economy as a whole because any funds spent in Hawai‘i would be at the expense of expenditures elsewhere. However, the majority of the project modifications costs will be Federally funded. As shown in Table ES-1, approximately $48.2 million to $64 million in project modification costs for army and road projects may be Federally funded over 10 years.

The range of $48.2 million to $64 million in project modification costs can be split into general conservation management expenditures and road construction expenditures. Based on the discussion of these project modifications in the direct costs section above, the general conservation

management expenditures will range from $39.2 million to $53.4 million over 10 years. As mentioned in the previous section, each additional $1 million spent in Hawai‘i on conservation management activities would generate approximately $1.8 million in direct and indirect sales in Hawai‘i, and would support approximately 22 direct and indirect jobs. As such, the project modification expenditures would generate roughly $71 million to $96 million over 10 years in direct and indirect sales in Hawai‘i, and would support about 862 to 1,175 direct and indirect jobs.

The road construction project modifications expenditures will range from $9 million to $10.6 million. Based on the multipliers in the Hawai‘i Input-Output model, each additional $1 million spent in Hawai‘i on road construction activities would generate approximately $2.1 million in direct and indirect sales in Hawai‘i, and would support approximately 15 direct and indirect jobs. As such, the project modification expenditures would generate roughly $19 million to $22 million over 10 years in direct and indirect sales in Hawai‘i, and would support about 135 to 159 direct and indirect jobs.

Combined, the conservation management and road construction project modification expenditures would generate roughly $90 million to $118 million over 10 years in direct and indirect sales in Hawai‘i, and would support about 997 to 1,334 direct and indirect jobs.

As mentioned above, the expansion of Hawai‘i’s economy through these expenditures is contingent upon how they are financed. If the project modifications are financed by new Federal funds to the State, then the increase in expenditures will contribute to increased economic activity in Hawai‘i. New funding for project modifications could come from the special funds in the Department of the Army or the Federal Highways Administration.

However, if increased expenditures on project modification are funded by matching funds from the State, or through funds from Federal sources already intended for use in the State, there would be no significant change in economic activity. In addition, some of the project modification costs are attributable to the listing of the plants and are not attributable to critical habitat alone. As such, and undetermined percentage of the $90 million to $118 million over 10 years and 997 to 1,334 direct and indirect jobs are attributable to critical habitat.

Regional Economic Activity Associated with Eco-tourism

Commercial eco-tours, via foot hikes, horseback riding, led by guides featuring the Big Island's unique eco-systems and endemic plants, are offered in portions of the proposed critical habitat. These may include guided tours into the Hakalau Forest (Units E and F) and hiking tours within the Hawai‘i Volcanoes National Park (Units H, I, J and L). Designation could benefit these operations by providing a marketing dimension that enhances the appeal of the eco-tours to visitors. However, this direct benefit is expected to be slight inasmuch as these areas are already regarded as being special due to their existing natural and cultural resources. In addition, in most if not all cases, the Service prefers that these commercial operations do not feature visits to view threatened and endangered plants since revealing their locations increases the risk that a species may be collected or damaged or its habitat harmed.

From a broader perspective, however, ecotourism could benefit from project modifications that enhance the quality of the ecosystem and expand the geographic scope of high-quality ecosystems, thereby increasing the appeal of eco-tourism tours to visitors.

Regional Economic Activity Associated with Avoided Costs to Developers

For areas that are regarded as *occupied* by the Service, the main advantage to developers of critical habitat designations is that they have more information on where they can site their projects. For example, knowledge of critical habitat boundaries can help developers avoid facing issues related to listed species. In the future, this may reduce delays and resultant revenue impacts associated with project modifications.

6.b.(2) Social Welfare Benefits of Habitat Designation

Critical habitat designation could also generate direct social welfare benefits. For example, economic literature has demonstrated individual's willingness-to-pay for preservation of open space, both in general, as well as specifically in the vicinity of their residence. Similarly, a survey sponsored by the Trust for Public Land and conducted in April 2000, revealed the approximate amount that Maui County voters were willing to pay to better protect open space, wildlife habitats, recreational areas, and land around rivers and streams. According to the survey, approximately 66 percent of the voters would support a "community lands and open space preservation fund" to protect land and water in Maui County, and funded by a 2.5-percent increase in the property tax. This works out to a total of about $1.38 million per year (based on estimated property-tax revenues of $83.4 million in FY 2000 x 2.5 percent x 66 percent), or an average of about $11 per resident per year (based on a county population of 128,100 in 2000). Thus, to the extent that designation results in preservation of open lands that might otherwise be developed, some welfare benefits may be created. However, much of the proposed critical habitat is already kept as open space by ranchers or by restrictions placed on activities by the Conservation District. As such, these benefits are likely to be small.

6.c. Indirect Benefits

6.c.(1) Social Welfare Benefits of Endangered Species Preservation

The primary purpose of critical habitat is to protect areas that are needed to conserve threatened and endangered species. Many economic studies have demonstrated social welfare benefits associated with the conservation and recovery of endangered and threatened species (e.g., Bishop 1978 and 1980; Brookshire and Eubanks, 1983; Boyle and Bishop, 1986; Hageman, 1985; Samples *et al*., 1986; Stoll and Johnson, 1984). Most research in this area has focused on mammals, birds, and fish. Depending upon the species, this literature indicates that households are willing to pay between $6 and $70 per year for species conservation, or one-time payments up to $216 (bald eagle, Loomis and White, 1996). These values may be motivated by expectations of future viewing opportunities, or a desire to preserve important natural resources for future generations.

Willingness-to-pay for a single species of endangered plant is likely to be lower than these amounts, particularly if the species is not well known to the general public. Few studies have focused on the value of preserving endangered plants and, given the scope of this analysis, no primary economic research was conducted on the value of species preservation. It is important to note, however, that some of these plant species have particular significance in an ethnobotanical context; that is, they are found in historical plant lore and in the agricultural customs of Native Hawaiians.

However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the lack of available studies and information relating to the size

and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the endangered plants will be present in the area); and 2) quantified data on the value of the Big Island species. As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation.

Some landowners have argued that critical habitat would make little or no contribution to the ultimate conservation of Hawai'i's threatened and endangered plants. They observe that many of these native plants are vulnerable because they are weaker and more fragile than non-native plants, and they grow more slowly. In particular, native plants lack the natural defenses (e.g., thorns, bitter tastes, offensive odors, etc.) to protect them from non-native pests (insects, diseases, rats, nematodes, birds, grazing animals, etc.), a vulnerability that reflects the fact that native plants evolved in isolation in a benign environment. Finally, many of the native plants cannot compete against aggressive fast-growing exotic plants, particularly when they are stressed, such as during droughts. In the long term, some argue that many listed plants will not be able to survive in the wild, with or without critical habitat designations. Nevertheless, critical habitat designations are mandated by law. And as long as these designations enhance the probability of the survival and conservation of listed species, regardless of how small that probability, critical habitat has value.

6.c.(2) Social Welfare Benefits of Broader Ecological Improvements

As discussed above, the survival and conservation of Hawai'i's native plants will require controlling feral ungulates. It is also recognized that ungulates cause additional environmental problems. Their browsing, digging, and trampling contribute to a loss of native habitat which, in turn, contributes to the loss of listed birds and other native birds, the endangered Hawaiian bat, and snails and insects that are either currently listed or are candidates for listing. Also, mosquitoes hatched in pig wallows frequently carry avian malaria and pox that contribute to the decline of native bird populations. Furthermore, certain ungulates (especially sheep and goats) can remove vegetation to such an extent that erosion becomes a major issue. In turn, the loss of vegetation can degrade watersheds, and the soil run-off can increase silt in streams thereby harming aquatic life; create layers of mud on otherwise sandy beaches; and bury near-shore reefs, thereby harming marine communities. Adverse impacts are more severe for bays and other protected marine environments that are not flushed by strong ocean currents.

In this manner, if feral ungulate control were undertaken for purposes of critical habitat, some complementary environmental improvements may be expected. These improvements may in turn improve ecosystem health and contribute to the welfare of residents and visitors. Similar to the benefits of species preservation discussed above, welfare benefits have also been ascribed to preservation of general biodiversity and ecosystem function (e.g., Pearce and Moran, 1994). However, there is significant uncertainty regarding the nature and extent of improvements specifically attributable to critical habitat. For this reason, coupled with a lack of existing economic research, these potential broader ecological benefits are not quantified.

7. SUMMARY OF ECONOMIC IMPACTS

For economic activities affected by the proposed plant critical habitat in the next 10 years, Table VI-3 summarizes the total section 7-related direct and indirect costs and benefits attributable to the plant listings and critical habitat.

Relatively few new developments, projects, land uses, and activities are expected to take place in a large percentage of the proposed critical habitat. This is due to (1) lands that are largely unsuitable for development and most other activities because of their rough terrain, difficult access, limited infrastructure, and remote locations; and (2) existing land-use controls that severely limit development and most other activities in parts of the proposed designation. Also, a number of projects and activities in the proposed critical habitat would not be subject to section 7 consultation either because there is no *Federal involvement,* the activities involve operation and maintenance of existing man-made features and structures, or the projects and activities would not impact the *primary constituent elements* essential to the survival and conservation of the plants.

However, portions of the critical habitat units support or are planned to support developments, projects land uses, and activities that are consistent with existing land-use controls, have *Federal involvement*, and are likely to affect the *primary constituent elements* for the plants. These projects and activities, as well as the associated direct section 7-related economic costs, are summarized in Table VI-3.

As shown in Table VI-3, over a 10-year time period the total direct section 7-related costs associated with the plant listings and critical habitat are $53.2 million to $71.8 million. The majority of these costs are attributable to anticipated project modifications associated with military activities at PTA in the northern portion of Unit AA ($30.7 million to $41.1 million), the Saddle Road Project in the northern portions of Unit AA and G ($7.1 million to $8 million), and the three road projects north of Kailua-Kona in Units Y1 and Y2 ($10.7 million to $15.7 million). Most of the direct consultation and project modification costs (approximately 90 percent) will be borne by the Service and other Federal agencies. The discounted present value of all of the 10-year direct section 7-related costs is $37.3 million to $50.4 million, and the annualized cost is $5.3 million to $7.2 million.[18] The annualized costs represent, in the worst case, about 0.23 percent of the total personal income of Hawai‘i County in 2000.

The potential indirect costs could be substantially larger than the direct section 7-related costs. While the probability of occurrence for most of the indirect effects is undetermined, the costs associated with these effects, were they to occur, may be large. Most of the potential indirect costs are associated with Units Y1 and Y2 (due to the significant amount of planned development and high property values); Unit Z (due to the value of the area for hunting and planned development); Unit AA (due to the value of the area to the military and for hunting); the portions of the units that contain important agricultural land; and the portions of the units that are potentially developable. Critical habitat could also have significant but un-quantifiable political and social costs in Unit Y2 (due to the potential loss of affordable housing and revenues to provide care for Native Hawaiian orphans and destitute children) and national security impacts in Unit AA (due to potential restrictions in training exercises at Pohakuloa Training Area). In a worst-case (i.e., a highest cost)

[18] Present value and annualized calculations are based on the OMB prescribed seven percent discount rate and the assumption that total costs are distributed evenly over the entire period of analysis.

scenario that is not anticipated to occur where all ungulates are removed from critical habitat, all of the land is redistricted to the Conservation District, conservation management is mandated for all of critical habitat, and the Army is unable to continue with transformation projects, the total 10 year indirect cost would range from $1.2 billion to $1.5 billion. However, the probability that the worst-case scenario will occur is undetermined. Thus, the expected value of the indirect cost of critical habitat is not estimated.

Designation of the proposed critical habitat and related actions taken to control threats to the plant species (e.g., ungulate control) may also generate economic benefits. These benefits may be related directly or indirectly to critical habitat and manifest in increased economic activity on the Big Island or social welfare. For the former, to the extent that critical habitat designation leads to additional conservation management activities and project modification expenditures funded by out-of-state sources, a local increase in economic activity may result. For the latter, species preservation and recovery and other complementary ecological improvements may generate social welfare benefits for residents and non-residents alike. However, the development of quantitative estimates associated with the benefits of the proposed designation is impeded by the lack of available studies and information relating to the size and value of beneficial changes that are likely to occur as a result of listing a species or designating critical habitat. In particular, the following information is not currently available: 1) quantified data on the change in the quality of the ecosystem and the species as a result of the designation (for example, how many fewer ungulates will roam into the critical habitat, how many fewer invasive plants will be introduced as a result, and therefore how many more of the endangered plants will be present in the area); and 2) quantified data on the value of the Big Island species. As a result, it is not possible, given the information that is currently available, to estimate the value associated with ecosystem preservation that could be ascribed to critical habitat designation. Instead, categories of benefits are discussed in qualitative terms.

Table VI-3. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat

(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal M = million

Item	Low	High	Explanation
DIRECT SECTION 7 COSTS			
Management of Game Hunting			
State-Managed Lands, Consultations	$ 6,440	$ 21,260	Consultation due to Pittman-Robertson funding
State-Managed Lands, PMs	$ 36,670	$ 61,600	Based on prior PMs
Residential Development			
Department of Hawaiian Homelands, Consultations	$ 70,200	$ 84,500	Consultation due to Fed funding
Department of Hawaiian Homelands, PMs	Minor	Minor	Low-density planning, so can avoid CH
Villages at La'i'opua	None	None	No Fed involvement
Other Residential Development	None	None	No Fed involvement
Industrial and Commercial Development			
Keahuolu Project	None	None	No Fed involvement
Kohanaiki Business Park Expansion	None	None	No Fed involvement
Kaloko Industrial Park Expansion	None	None	No Fed involvement
Farming and Ranching Operations			
Farm Service Loans, Consultations	$ 48,500	$ 103,000	Consultations due to Fed funding
Farm Service Loans, PMs	Minor	Minor	Major PMs not anticipated
Forestry	None	None	No Fed involvement
Military Activities			
Army, Consultations	$ 3,933,200	$ 5,052,300	Consultation due to Fed funding
Army, PMs	$ 30,700,000	$ 41,100,000	PMs could include: management and relocations of listed plants, threat management, education
National Parks and Wildlife Refuges			
Volcanoes National Park (VNP), Consultations	$ 3,800	$ 7,600	Consultation due to Fed funding
VNP, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
VNP Expansion, Consultations	$ 62,100	$ 62,100	Consultation due to Fed funding
VNP Expansion, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Hakalau National Wildlife Refuge, Consultations	$ 3,800	$ 11,400	Consultation due to Fed funding
Hakalau National Wildlife Refuge, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
State Managed Areas			
Hapuna Beach State Rec Area	None	None	No Fed involvement
Natural Area Reserves (NAR)			
Kipahoehoe NAR, Consultations	$ 5,200	$ 5,200	Consultation due to Fed funding
Kipahoehoe NAR, PMs	None	None	No PMs due to beneficial nature of activities
Pu'u Maka'ala NAR, Consultations	$ 5,200	$ 15,600	Consultation due to Fed funding
Pu'u Maka'ala NAR, PMs	None	None	No PMs due to beneficial nature of activities
Manuka NAR Trail, Consultations	$ 19,600	$ 19,600	Consultation due to Fed funding
Manuka NAR Trail, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Manuka NAR Fencing, Consultations	$ 5,200	$ 5,200	Consultation due to Fed funding
Manuka NAR Fencing, PMs	None	None	No PMs due to beneficial nature of activities
State Forest Reserves			
Fire Management, Consultations	$ 5,200	$ 10,400	Consultation due to Fed funding
Fire Management, PMs	None	None	No PMs due to beneficial nature of activities
Roads			
Existing Roads	None	None	O&M not subject to section 7
New Roads, Consultations			
Saddle Road, Conference/Re-initiation	$ 20,700	$ 20,700	Conference/Re-initiation due to Fed funding
Saddle Road, PMs	$ 7,100,000	$ 8,000,000	PMs could include: avoidance of listed plants, threat management, and conservation set-asides.
Keahole to Keauhou (K-to-K), Consultations	$ 98,600	$ 98,600	Consultation due to Fed funding
K-to-K Region, PMs	$ 10,700,000	$ 15,700,000	PMs could include: avoidance of listed plants, threat management, and conservation set-asides.

Table VI-3. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat, Continued

(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal M = million

Item	Low	High	Explanation
Conservation Projects			
Projects Funded by the Service, Consultations	$ 11,400	$ 22,800	Consultation due to Fed funding
Projects Funded by the Service, PMs	None	None	No PMs due to beneficial nature of activities
USDA Conservation Programs, Consultations	$ -	$ 76,000	Consultation due to Federal funding
USDA Conservation Programs, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Nature Conservancy Projects, Consultations	$ 15,600	$ 31,200	Consultation due to possible Federal funding
Nature Conservancy Projects, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Other Conservation Projects, Consultations	$ 20,800	$ 41,600	Consultation due to possible Federal funding
Other Conservation Projects, PMs	Minor	Minor	PMs minor due to beneficial nature of activities
Water Systems			
Potable Water System	None	None	No Fed involvement
Non-potable Water Systems, Consultations	$ 10,100	$ 33,200	Consultation due to possible Fed funding
Non-potable Water System, PMs	None	None	No PMs due to beneficial nature of activities
Fire Management			
Pre Suppression, Consultations	$ 9,700	$ 19,400	Consultation due to Fed funding
Pre Suppression, PMs	None	None	No PMs due to beneficial nature of activities
Fire Suppression, Consultations	$ 52,000	$ 314,000	Consultation due to Fed funding
Fire Suppression, PMs	None	None	No PMs due to beneficial nature of activities
Communications Facilities			
New Facilities, Consultations	$ 13,700	$ 27,300	Consultation due to FCC and/or FAA permits
New Facilities, PMs	-	600,000	Due to additional permits or site relocation costs
Golf Courses	None	None	No Fed involvement
State Trail and Access System			
Consultations	$ 5,200	$ 5,200	Consultation due to Fed funding
PMs	None	None	PMs not anticipated
Drug Enforcement			
Consultations	$ 5,200	$ 31,400	Consultation due to DEA funding
PMs	187,500	225,000	Due to cost of biological monitor
Natural Disasters			
FEMA Recovery Projects, Consultations	$ 3,800	$ 7,500	Consultation due to FEMA funding
FEMA Recovery Projects, PMs	Minor	Minor	Few adverse impacts anticipated
USDA Disaster Assistance, Consultations	$ 3,800	$ 7,500	Consultation due to USDA funding
USDA Disaster Assistance, PMs	Minor	Minor	Few adverse impacts anticipated
Ecotourism	None	None	No Fed involvement
TOTAL DIRECT COSTS			
Direct	**$ 53,163,210**	**$ 71,821,160**	Total may understate economic impact because the cost of "minor" project modifications are not included
Discounted Present Value	**$ 37,339,614**	**$ 50,444,177**	Present value and annualized calculations are based on the OMB prescribed seven percent discount rate and the assumption that total costs are distributed evenly over the entire period of analysis.
Annualized	**$ 5,316,321**	**$ 7,182,116**	

Table VI-3. Section 7 Costs & Benefits Attributable to the Plant Listings & Critical Habitat, Continued

(10-year estimates)

CH = critical habitat PMs = project modifications O&M = operation and maintenance Fed = Federal M = million

Item	Explanation and Worst- or Best- Case Scenario Estimates
INDIRECT COSTS *	
Management of Game Mammals & Loss of Hunting Lands	Small probability of a 10 year loss of $13 M in direct sales, $23M in total direct and indirect sales, $7.6 M in income, and $6.8 M in hunter benefits. Additional losses include the value of the hunting meat to the hunters and their families and the social and cultural value of hunting to the community.
Redistricting of Land by the State	Redistricting or the risk of redistricting could lead to a loss of an undetermined percentage of $300 M to $400 M, plus unquantifiable political and social impacts.
Conservation Management	Low probability of a loss of $250 M to $430 M, plus the loss of the value of the hunting meat to the hunters and their families and the social and cultural value of hunting to the community.
State and County Development Approvals	Costs of $200,000 to $525,000 prepare an EIS for eight projects. Additional costs to projects range from insignificant to substantial.
Reduced Property Values	Loss of undetermined percentage of $115 M to $205 M in property values.
Subsistence and Native Hawaiian Practices	Slight probability of a moderate impact.
Military Readiness	Undetermined probability of a loss of $693 M and an undetermined increase in the probability that the Army could leave Hawai'i
Condemnation of Property	No condemnation resulting from CH. Also, the Service acquires land by negotiation, not condemnation.
Investigate Implications of CH	84 private landowners may investigate the implications of CH on their lands at a cost of $273,000 to $798,000
Loss of Conservation Projects	Some landowners want to avoid CH designation
DIRECT BENEFITS	
Regional Economic Activity	
Medical/Pharmaceutical Benefits	Probability of medical/pharmaceutical value unknown
Conservation Management	Low probability of conservation management which could lead to an expansion of Hawai'i's economy by an undetermined percentage of $358 M to $675 M over 10 years.
Project modifications	Expansion of Hawai'i's economy by an undetermined percentage of $90 M to $118 M over 10 years.
Ecotourism	Project modifications attributable to critical habitat could enhance the quality of the ecosystem thereby increasing the appeal of ecotourism tours to visitors.
Avoided Cost to Developers	Occupied critical habitat helps developers site projects
Social Welfare Benefits of Habitat Designation	Critical habitat not anticipated to significantly add to the preservation of open space
INDIRECT BENEFITS	
Benefits of Endangered Species Preservation	Difficult to estimate preservation benefits and their value
Benefits of Broader Ecological Improvements	Difficult to determine environmental improvements attributable to the implementation of section 7

*** Although the analysis does provide general estimates of some of the potential indirect costs, these estimates are not totaled because of the speculative nature of many of these costs. Instead, this table reports qualitatively on their likelihood and quantitatively on their potential magnitude. For additional information on any of these indirect impacts, the reader should refer to the economic cost and benefit chapter of the analysis (Chapter 6).**

APPENDIX VI-A

Information on Hunting and Game-Mammal Management

1. INTRODUCTION

Presented below is background information on hunting on the Big Island and DLNR's game-mammal management. The material is used in Chapter VI in addressing direct and indirect economic impacts of critical habitat on game-mammal management. Subjects addressed include the following: hunting activity on the Big Island, economic activity associated with hunting, the value of hunting to hunters, DLNR game management, the loss of hunting areas to the *palila* critical habitat, information on the Pittman- Robertson Act, consultation with the Service on Pittman-Robertson projects, and recent changes in hunting fees.

2. HUNTING ACTIVITY ON THE BIG ISLAND

Hunting is an important activity for the Big Island, because it provides recreation, subsistence, and a desired lifestyle. Subsistence hunting is particularly important on the Big Island because of the rural lifestyle and the high level of unemployment in some areas. Hunting is largely a local activity, with approximately five percent of the game- mammal hunters coming from off-island (based on DLNR estimates, 2001). However, the creation of a DLNR website about hunting has increased phone calls from potential visitors requesting additional information about hunting in Hawai‘i.

Game mammals hunted on the Big Island include feral pigs, goats and sheep. Game birds include chestnut bellied sandgrouse; chukar partridge; Francolin (three species); pheasant (three species); quail (three species); dove (three species); and wild turkey.

3. ECONOMIC ACTIVITY ASSOCIATED WITH HUNTING

In 2001, 17,000 hunters in the State of Hawai‘i, most of whom were local residents, spent an estimated 316,000 days and about $15.1 million on hunting, of which about $8.1 million was trip-related and about $7 million was for equipment and other expenses (2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation). Approximately 70 percent of their hunting trips were spent hunting game mammals and the remaining trips were for game birds. Based on hunting licenses issued, about 32 percent of the State's hunters live on the Big Island (information provided by DLNR, 2001).

Companies that supply goods and services to hunters, and the employees of these companies, in turn purchase goods and services from other companies, thereby creating even more sales, and so on. These "indirect" sales are scattered throughout the economy and the State. When both "direct" and "indirect" sales are included, total statewide sales due to hunting in Hawai‘i amounted to about $26.8 million in 2001. In turn, this economic activity supported an estimated 450 jobs and generated an estimated $8.8 million in income (an average of about $19,400 per job). These estimates are based on multipliers from the Hawai‘i Input-Output Model. (DBEDT, 2002).

In 2001, economic activity supported by just game-mammal hunting on the Big Island amounted to about $3.4 million in direct sales, $6 million in total direct and indirect sales, 100 jobs,

and $2 million in income. These figures are order-of-magnitude estimates based on 70 percent of the hunting trips being spent hunting game mammals and 32 percent taking place on the Big Island.

4. VALUE OF HUNTING TO HUNTERS

The net value of hunting opportunities to hunters is based on what they would be willing to pay above and beyond their expenditures for hunting equipment, supplies, and travel to participate. "Consumer surplus" is the standard measure of value used in cost-benefit analyses. The statewide value of all hunting for 2001 is estimated at $7.9 million, based on (1) the assumption that hunters value their experience at $25 per day; and (2) they hunted a total of 316,000 days that year. The value of just game hunting amounted to about $1.8 million for the Big Island ($7.9 million x 70 percent x 32 percent). These figures on the value of game hunting should be interpreted as order-of-magnitude estimates, not precise estimates.

The valuation of hunting at $25 per day is consistent with estimates of the valuation of hunting from the following economic studies:

— $19.18 or $26.86 per day for hunting deer in Idaho in 1986, with the different amounts being based on methodology, but with the higher amount being deemed more accurate (Donnell and Nelson, 1986)

— $22.45 or $28.50 per day hunting for jack rabbits and game birds in Idaho in 1986, with the different amounts being based on methodology, but with the higher amount being deemed more accurate (Young, et al. 1986)

— $21.66 or $24.44 per day for hunting pheasant in Idaho in 1986, with the different amounts being based on methodology, but with the higher amount being deemed more accurate (Young, et al., 1986)

— $16.56 per day for hunting pheasant in Idaho in 1971 (Shulstad, 1978)

A valuation of hunting based on the market value of the meat harvested in excess of the hunters' expenditures on hunting (i.e., the subsistence value of hunting) would be lower. In effect, hunting is largely a recreational pursuit for which expenditures on equipment and travel, and the value of the time spent hunting and butchering the animals, are partially offset by the value of the meat harvested.

5. DLNR GAME MANAGEMENT

DLNR is the State agency responsible for managing game-mammal populations in State Hunting Units. However, it must carry out this responsibility in the context of two conflicting mandates: provide for sustained-yield recreational hunting in some of the State Hunting Units and protect native ecosystems and plants in other areas.

DLNR achieves what they regard as a reasonable balance between the two mandates by permitting recreational hunting based on site conditions (e.g., animal population and food supply) and habitat quality (nearly pristine, highly degraded, or somewhere in between) (see Appendix VI-B). For example, the most liberal hunting (e.g., year-round pig hunting) is permitted in nearly pristine areas that have suffered the least environmental damage. This helps keep game-mammal populations low in these sensitive areas, thereby minimizing harm to native ecosystems and to

endangered and threatened species. However, hunting is not possible in many remote areas that are inaccessible to hunters.

In areas where the native forest is highly degraded and DLNR sees no hope that the native vegetation will return, hunting is restricted in order to sustain larger populations of game mammals (see below for the methods used to restrict hunting). When hunting is restricted, the larger populations allow hunters to harvest more animals each year than would be the case with smaller populations. In addition to the recreational benefits to hunters of having higher game harvests, reasonable numbers of game mammals are available to browse on the non-native plants and weeds, thereby helping control the seed reservoir of noxious non-native plants and their spread into other areas.

Finally, in degraded areas, exclosure fencing of small areas (of less than two acres) may be used to protect rare native plants and their seeds from foraging animals. These exclosures are small enough to make it practical to weed the overgrowth of aggressive alien plants which would otherwise choke out the native plants or carry a wildfire.

According to DLNR, the combined strategy of using game mammals to help control non-native plants and weeds in degraded areas and using hunters to help control ungulate populations in pristine areas is accomplished at little cost to the taxpayer while providing recreational benefits to hunters.

However, it should be noted that Service staff and expert biologists question the effectiveness of DLNR's game-management approach in protecting native forests, arguing that so long as large populations of feral ungulates are free to range, they will migrate into areas that are not degraded, possibly because they are fleeing from hunters or searching for better forage than what they can find in degraded game-production areas. In turn, their migration into these areas will contribute to the loss of endangered species and to the spread of noxious plants. Also, the State exclosures are regarded by the Service as too small to sustain viable populations of threatened and endangered plants (Service, *Recovery Plan for the Multi-Island Plants*, 1999).

The methods employed by DLNR to manage game-mammal populations take advantage of the fact that the demand for hunting opportunities exceeds the availability of game mammals. Within each State Hunting Unit, DLNR controls the amount of hunting activity by using such restrictions as: bag limits, hunting method (rifle, muzzleloader, bow and arrow, dogs and knives); days allowed (week-ends only), hunting seasons; hours of the day; and for some areas, a limit on the number of daily permits issued (Hawai‘i Administrative Rule, Title 13, Chapter 123). However, hunting activity falls off if hunters' success rates are low (which usually occurs when too many hunters are after too few animals) or if certain areas are difficult to access. Also, some of the hunting restrictions are for safety purposes: limiting the number of hunters prevents dangerous overcrowding and risks to both hunters and other recreational users in the area (e.g., hikers and campers).

If the game-mammal surveys indicate that the game-mammal populations have become too high for an area, DLNR responds by allowing more hunting. But if increased hunting does not reduce the population sufficiently—possibly because of difficult access to a remote area—then DLNR may direct staff to remove the animals where economically feasible.

To provide guidance for adjusting the controls on hunting activity, DLNR monitors the following: (1) hunting activity (including the number of hunting trips, game harvests by type of

game, and success rates); (2) game populations (using habitat transects, harvest data, hunter reports, and aerial and ground surveys); and (3) vegetation (including the coverage, composition by type of plant, invasion by non-native plants, trends, comparisons with vegetation inside animal exclosures, and impacts to plants from game mammals). But the management of game-mammal populations is not an exact science. For example, animal population estimates may be inaccurate; populations vary with rainfall and food availability; and animals move from one area to another.

6. LOSS OF HUNTING AREA UNDER THE *PALILA* DECISION

Based on past experience, most hunters in Hawai'i associate critical habitat designation with loss of prized hunting areas. The association is based on the *palila* critical habitat on the Big Island.

In 1975, the Service listed the *palila (Psittirostra bailleui),* a Hawaiian honeycreeper (a bird), as an endangered species. The *palila* depends entirely on the *mamane-naio* ecosystem—a broad band of sparse forest encircling Mauna Kea between about 7,000 and 10,000 feet elevation. In 1977, in an effort to further protect the *palila*, the Service designated the *palila* critical habitat, encompassing about 67,000 acres (105 square miles) of hunting land.

The *palila* were at risk because sheep and goats on Mauna Kea browsed on the *mamane* trees in the *mamane-naio* ecosystem, which was very destructive to the *palila's* habitat. Starting in the late 1940s, the population of game mammals was allowed to increase on the mountain to allow sustained harvest by hunters. Even after the *palila* was listed as endangered and its critical habitat was designated, DLNR continued to manage the feral sheep and goat populations at sustainable levels for hunting, causing continued harm to the *palila's* habitat.

This situation led the Sierra Club Legal Defense Fund to file a lawsuit in Federal court, *Palila v. Hawaii Department of Land and Natural Resources* (471 F.Supp. 985 (D. Haw. 1979)), to require DLNR to remove the feral sheep and goats from Mauna Kea. The case tested the prohibition in the Act on *taking* of any endangered species of fish or wildlife, where *take* is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." At issue was whether modifying a habitat (i.e., in this case sheep browsing on *mamane* trees) may result in "harm" to a species thereby meeting the definition of "taking."

In 1979, a Federal court rendered an opinion in support of the plaintiff. Since studies showed clearly that the sheep and goats were "destroying or altering" the *palila* habitat, the court ordered DLNR to eradicate them from Mauna Kea and this was nearly achieved by 1981. The ruling did not affect the management of pigs on the mountain.

Following this case, the Service regulations defined "harm" to be "an act which actually kills or injures wildlife." The regulations further explain that "[s]uch act may include significant modifications where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."

Even though Hawai'i hunters may associate critical habitat designation with eradicating game animals and loss of prized hunting areas, the eradication of sheep and goats from the *palila* habitat was based on the Federal prohibition against *taking* a listed species contained in section 9 of the Act and not on critical habitat. Furthermore, a situation similar to the circumstances of the *palila* case would not apply to the habitat for plants since the Federal *taking* provision applies only to listed wildlife and not to plants. In additions, while the State's endangered species act does have

a *taking* provision for listed plants, it does not include a prohibition on "harm" which was the issue litigated in the *palila* case.

7. PITTMAN-ROBERTSON ACT

Game-management funding is provided as part of the Federal Aid in Wildlife Restoration Act (16 USC §§ 669-669i), commonly referred to as the Pittman-Robertson Act. This Act was passed by Congress in 1937 to help restore the nation's wildlife following accumulated damage to forests and grasslands and extensive commercial harvesting of wildlife. Hawai'i's local hunters help fund this program, since revenues for it are derived from an 11 percent Federal excise tax on the price of sporting arms, ammunition, and archery equipment, and a 10 percent tax on handguns. Each state's share of these revenues is determined by a formula that considers the total area of the state and the number of licensed hunters in the state, subject to a minimum level of funding. Each state provides matching funds of at least 25 percent of the program costs from a non-Federal source. Also, each state specifies how the funds are to be spent, while the Service serves as an administrative check to insure that the funds are spent in compliance with the Act.

Because of its small area and population, Hawai'i receives the minimum level of Pittman-Robertson funding. For FY2001, total funding amounted to nearly $1.1 million, of which about $817,000 was federally funded and about $272,000 was State-funded. The Big Island received about $240,000 for its game-management program plus another $70,000 for non-game programs.

8. GAME MANAGEMENT CONSULTATION HISTORY

8.a. 1995 Pittman-Robertson Consultation

In March 1995, the Service conducted an internal consultation regarding Pittman-Robertson funding for a series of DLNR projects statewide. Projects included game bird and game mammal surveys; construction of game mammal and bird water units; mowing and clearing of vegetation from Game Management Areas; and maintenance of existing structures and features. In order to minimize impacts to listed plant species, DLNR proposed to construct exclosure fencing around listed plants; construct new game units in disturbed or previously cleared areas; survey all areas before they were cleared or mowed; and have a knowledgeable person supervise other mowing or maintenance activities to ensure that no inadvertent harm came to listed plants. With these precautions, the Service determined that the proposed projects were not likely to affect the listed species.

8.b. 2001 Pittman-Robertson Consultation

The 2001 Pittman-Robertson statewide consultation required approximately one man-month of the Service's time, and 60 man-days of the State's time. Based on current salaries and benefit levels, administrative time, and overhead costs, the time spent in consultation cost the Service about $15,600 and the State about $12,000.

During consultation, the Service approved with some modification 65 of 67 game-management projects proposed by DLNR. The Service determined that the two remaining projects could adversely affect listed species. One concerned hunter check stations and game-mammal surveys on Kaua'i. In this case, the Service requested assurances from DLNR that information collected from check stations and surveys would not be used to maintain or enhance free-ranging game-mammal populations that could adversely affect federally listed species. For all islands,

except Kaua‘i and Lana‘i, DLNR provided the necessary assurances and the Service concluded that these projects were not likely to adversely affect listed species. For Kaua‘i, DLNR chose to withdraw the project from consideration rather than (1) modify it to avoid adverse impacts to listed species, or (2) pursue a formal consultation.

The second exception concerned a portion of a project that involved leasing 30,000 acres on Lana‘i for State-managed game hunting, maintenance of hunter check stations, maintenance of game- mammal watering units, and game-mammal population surveys. Because the Service determined that funding the Lana‘i portion of this project was likely to adversely affect listed species, the Service was unable to approve it as requested. Again, DLNR opted to withdraw the offending Lana‘i portion of the project rather than (1) modify it to avoid adverse impacts to listed species, or (2) pursue a formal consultation. Modification could have involved expensive fencing to prevent game mammals from migrating into areas that support listed species.

For either or both of the two projects discussed above, DLNR could have pursued formal consultation with the Service with the possibility that they would have received a determination by the Service that the projects were not likely to *jeopardize* the continued existence of listed species and could be funded. But DLNR opted not to do so because: (1) time was too short to assemble needed information and complete the formal consultation; (2) the staff had to make fiscal and budgetary commitments; and (3) the outcome was uncertain.

Instead, DLNR elected to shift funding sources for its wildlife management projects: State monies were used to fund the Kaua‘i and Lana‘i projects mentioned above, and the remaining Pittman-Robertson funds were used for projects that were originally scheduled to be funded by the State (e.g., game-bird projects). The net effect was no change in the amount of Pittman-Robertson funding provided to DLNR, and modest changes to the wildlife management projects themselves.

On Kaua‘i, DLNR elected to drop a proposed helicopter goat survey project rather than fund it entirely with State monies. The helicopter services would have cost about $4,000. No changes were required for O‘ahu projects.

The more significant changes in Maui and Hawai‘i Counties involved some new fencing and lids to protect game-bird water stations from being used by game mammals in areas having listed plants. The cost totaled about $110,000 for 29 units on Maui island, 12 units on Moloka‘i and about 70 units on Hawai‘i island (based on information provided by DLNR, 2002). These projects (1) decreased game-mammal populations in the affected areas or required separate State-funded water stations for game mammals and (2) diverted Pittman-Robertson and State funds from other projects to pay for the additional fencing, lids, and new game-mammal water stations.

The listed plants critical habitat designation had no role in the above decisions, however, since critical habitat had not yet been designated. The consultation between DLNR and the Service on projects proposed for Pittman-Robertson funding, modifications that were made to projects to avoid adverse impacts, and DLNR’s decisions to withdraw the Kaua‘i and Lana‘i projects and to shift funding sources among projects occurred entirely because of the presence of listed species in affected areas.

9. HUNTING FEES

In February 2002, the Board of Land and Natural Resources increased State hunting fees which are expected to increase revenues to the State by about $200,000 per year. The additional fees will give DLNR additional money and flexibility in funding game-management projects.

APPENDIX VI-B

Resource Management Guidelines
Department of Land and Natural Resources
Division of Forestry & Wildlife

"The basis of the Division of Forestry & Wildlife's (DOFAW's) Resource Management Guidelines is the status of the native vegetation in an area. The character of the vegetation is classified as: 'Most Pristine Native,' 'Native,' 'Considerably Disturbed,' or 'Badly Degraded or Highly Altered.' The vegetation status is then considered in conjunction with public safety, public demand for specific resources, and the effect of the proposed use on the vegetation.

Potential game management strategies have been divided into four categories, called Game Animal Management Classifications. These are:

— Game Production. Game is a primary objective. Areas are managed for public hunting on a sustained-yield basis. Habitat may be manipulated for the purpose of increasing or maintaining the game carrying capacity of the habitat. Hunting seasons and bag limits are set to provide sustained public hunting opportunities and benefits. Some of the Game Management Areas are in this class.

— Mixed Game and Other Uses. Production of game is an objective integrated with other uses such as hiking, production of forest products, and protection of native resources. Game populations are managed to acceptable levels using public hunting. Habitat manipulation for game enhancement may be conducted, but only when it is consistent with other uses. Seasons and bag limits are designed to ensure compatibility with other uses. These areas include portions of forest reserves and some Game Management Areas.

— Game Control. Protection of resources is the primary objective, with emphasis on native plant community and watershed protection. Hunting is used to reduce animal impacts to those resources. Bag limits or seasons are liberal. These areas include watershed areas, portions of forest reserves, Natural Area Reserves, and wilderness preserves.

— Staff Control. Areas designated for animal removal by staff or agency designees because of remoteness, environmental sensitivity, or public safety. Game mammal control is the objective. Control actions can include but are not limited to staff shooting or animal translocation. These areas include portions of forest reserves, Natural Area Reserves, wilderness reserves, and plant and wildlife sanctuaries.

Under DOFAW's Resource Management Guidelines, maintaining game bird populations is considered compatible with other uses in most areas. Game birds are managed for 'Game Production' or 'Mixed Game and Other Uses' in most areas.

Because of potential detrimental effects of game mammals on native ecosystems, management strategy for game mammals is more complex. Areas managed for game mammal

production; i.e., 'Game Production,' are located primarily in areas classified as 'Badly Degraded or Highly Altered.' These areas have a preponderance of weedy species, contain very few native plants, and are managed to produce game animals for recreational hunting. Under this management approach, known individuals or populations of listed plants are fenced or otherwise protected from feral ungulates. Areas classified as 'Predominantly Native' and 'Considerably Disturbed' are managed as 'Mixed Game and Other Uses' for game mammals and have seasons and bag limits designed to ensure compatibility with other uses, including native ecosystem protection. Areas classified as 'Most Pristine Native' are managed for 'Game Control or Staff Control' and have the most liberal hunting seasons to minimize the pressure of feral animals on native ecosystems."

Hawai'i Department of Land and Natural Resources
Undated

REFERENCES

Belt Collins & Associates. *Keahuolu Lands of Kailua-Kona, Final Environmental Impact Statement.* Honolulu, Hawai'i. October 1990.

Belt Collins. *Master Plan, Ka'upulehu Mauka.* Prepared for PIA-Kona Limited Partnership. April 3, 2001.

Clark, Hugh. "Big Island Jobs Intact Throughout 9/11 Fallout." *Honolulu Advertiser*. August 23, 2002.

Cordell, Susan. "Restoring Native Hawaiian Dry Forests." *Hawai'i Landscape.* May/June, 2002.

County of Hawai'i, Department of Planning. *Draft County of Hawai'i General Plan Revision*. December 21, 2001.

County of Hawai'i, Department of Planning. *Keahole to Kailua Development Plan*. April 1991.

County of Hawai'i, Department of Research and Development. *County of Hawai'i Data Book.* Annual.

County of Hawai'i, Deputy Managing Director. Letter re: Cooperative Planning and Infrastructure Development Keahole to Kailua (K-to-K) Region of North Kona. May 7, 2002.

County of Hawai'i. *Keahole to Kailua Project Update*. February 14, 2002. Accessed at http://www.co.hawaii.hi.us/info/k2k/K2K-M.htm

County of Hawaii, Real Property Tax Office. Real Property Tax Assessment information. 2002. Accessed at http://www.hawaiipropertytax.com/

DeLorme. *Hawai'i Atlas & Gazetteer, Topo Maps of the Entire State, Guide to Outdoor Recreation.* Yarmouth, Maine. 1999.

Donnelly, Dennis M., and Louis J. Nelson. "Net Economic Value of Deer Hunting in Idaho." *USDA Forest Service Resource Bulletin RM-13.* Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 1986.

Dun & Bradstreet. Duns Market Identifiers. July 2002.

Environmental Working Group. EWG Farm Subsidy Database. May 2002. http://www.ewg.org/farm/help/instructions.php.

Fairbank, Maslin, Maullin & Associates, and Qmark Research & Polling. "Highlights of Maui County Voter Survey." For The Trust for Public Land. May 30, 2000.

Handy, E.S. Craighill, Elizabeth Green Handy, and Mary Kawena Pukui. *Native Planters: In Old Hawaii Their Life, Lore, and Environment.* Honolulu, Hawai'i. 1972.

Hawai‘i Agricultural Statistics Service. *Statistics of Hawai‘i Agriculture.* Hawai‘i Department of Agriculture, Agricultural Development Division and U.S., Department of Agriculture, National Agricultural Statistics Service. Annual.

Hawai‘i Ecotourism Association. “Location.” April 18, 2002. http://www.hawaiiecotourism.org/island.htm

Hawai‘i Forest Industry Association. *Dryland Forest Restoration Project, Ka‘upulehu Preserve, Hawai‘i.* July 8, 1998.

Hawai‘i Revised Statutes.

Hawai‘i Supreme Court. *Public Access Shoreline Hawai‘i v. Hawai‘i County Planning Commission*. 79 Haw. 425 (1995), *cert. denied*, 517 U.S. 1163 (1996).

Hawaiian Electric Industries, Inc. *2001 Statistical Supplement and Utility Forecast.* 2002.

Institute of Social and Economic Research and Industrial Economics, Inc. *Economic Assessment of Bristol Bay Area National Wildlife Refuges: Alaska Peninsula/Becharof Izembek Togiak Final Draft.* Cambridge, MA. 1998.

John Child & Company. Letter to Queen Lili‘uokalani Trust re: Preliminary Assessment of the Impact of the Proposed Critical Habitat Designation on the Market Value of the QLT Lands in Kailua-Kona, Hawai‘i. Honolulu, Hawai‘i. October 16, 2002.

John M. Knox & Associates, Inc. *Socio-Economic Impact of “Critical Habitat” Designation for the Keahuolu Project of Queen Lili‘uokalani Trust*. Waimanalo, Hawai‘i. September 27, 2002.

Juvik, J.O. And S. P. Juvik, University of Hawai‘i—Hilo, Department of Geography. *Mauna Kea and the Myth of Multiple Use Endangered Species and Mountain Management in Hawai'i.* Mountain Research and Development, Vol. 4, No. 3, pp. 191-202, Hilo, Hawai‘i. 1984.

Juvik, Sonia P. and James O. Juvik. *Atlas of Hawai‘i*. Third edition. University of Hawai‘i Press: Honolulu. 1998.

Kaiser, Brooks, and Nancy Krause, Dee Mecham, Jessica Wooley and James Roumasset. *Environmental Valuation and the Hawaiian Economy* (Draft). Honolulu, Hawai‘i. September 1999.

Kamehameha Schools. *Annual Report July 1, 2000 - June 30, 2001.*
Kimura International, Inc. *Kaloko Town Center, Final Environmental Impact Statement*. September, 1996.

Loomis, J.B. and White, D.S. “Economic Benefits of Rare and Endangered Species: Summary and Meta-analysis.” *Ecological Economics.* 1996.

MacKenzie, Melody Kapilialoha. *Native Hawaiian Rights Handbook*. Honolulu, Hawai‘i. 1991.

Matsuoka, Jon, Davianna McGregor and Luciano Minerbi. “Molokai: A Study of Hawaiian Subsistence and Community Sustainability.” In *Sustainable Community Development: Studies in Economic, Environmental, and Cultural Revitalization*. Marie Hoff, ed. Honolulu, Hawai‘i. 1998.

Memorandum to the Service, Washington Office, from the Service, Honolulu Field Office re: Possible Mapping Errors and Unmapped Holes in the Big Island Plants Proposed Critical Habitat. October 2, 2002.

Morgan, Joseph R. *Hawai'i, A Unique Geography*. Bess Press, Honolulu, Hawai'i. 1996.
Natural Energy Laboratory of Hawaii. Home Page. Accessed at http://www.nelha.org/ on September 9, 2002.

Onyx Group. *Final Phase II Engineering Evaluation/Cost Analysis, Former Waikoloa Maneuver Area and Nansay Site*s. January 2002

PBR Hawai'i. *Kohanaiki Mauka Environmental Impact Statement.* October 1991.

Pukui, Mary Kawena, and Samuel H. Elbert. *Hawaiian Dictionary.* University of Hawaii Press, Honolulu, Hawai'i. 1986.

R. M. Towill Corporation. *Kealakekua Ranch Lands, Environmental Assessment.* February 1993.

Shulstad, Robert N., and Herbert H. Stoevener. "The Effects of Mercury Contamination in Pheasants on the Value of Pheasant Hunting in Oregon." *Land Economics.* February 1978.

State of Hawai'i, Department of Business, Economic Development and Tourism. *Annual Visitor Research Report.* Honolulu, Hawai'i. Annual.

State of Hawai'i, Department of Business, Economic Development & Tourism. *The Hawai'i Input-Output Study: 1992 Benchmark Report.* Honolulu, Hawai'i. December 1998.

State of Hawai'i, Department of Business, Economic Development & Tourism. *The Hawai'i Input-Output Study: 1997 Benchmark Report.* Honolulu, Hawai'i. March 2002.

State of Hawai'i, Department of Business, Economic Development & Tourism. *The State of Hawai'i Data Book, A Statistical Abstract.* Honolulu, Hawai'i. Annual.

State of Hawai'i, Department of Business, Economic Development & Tourism, Office of Planning. *GIS Maps of Hawaii*. ArcIMS Test Site. July 2002.

State of Hawai'i, Department of Land and Natural Resource, Na Ala Hele Program. Na Ala Hele Trail and Access System. www.hawaiitrails.org

State of Hawai'i, Department of Land and Natural Resources, Division of Forestry and Wildlife. *Report to the Twenty-first Legislature Regular Session of 2002 Hawai'i Statewide Trail and Access System known as "Na Ala Hele."* November 2001.

State of Hawai'i, Department of Land and Natural Resources, Division of Forestry and Wildlife. *Annual Report to the Twenty-first Legislature Regular Session of 2002 Natural Area Reserves System and Natural Area Partnership Program.* November 2001.

State of Hawai'i, Department of Land and Natural Resources, Division of State Parks. *Hapuna Beach State Recreation Area Expansion, Final Environmental Impact Statement.* Honolulu, Hawai'i. May, 2001.

State of Hawai‘i, Department of Land and Natural Resources, Division of Forestry and Wildlife and Division of State Parks. *Draft Management Plan for the Ahupuaa of Puuwaawaa and the Makai Lands of Puuanahulu.* Hawai‘i. July 2002.

State of Hawai‘i, Department of Land and Natural Resources, Division of Forestry and Wildlife, Fire Management Program. *Annual Report FY 2001-02.* 2002.

State of Hawai‘i, Department of Land and Natural Resources. “Conservation District.” Hawai‘i Administrative Rules, Title 13, Subtitle 1, Chapter 5. Honolulu, Hawai‘i.

State of Hawai‘i, Department of Land and Natural Resources. “Indigenous Wildlife, Endangered and Threatened Wildlife, and Introduced Wild Birds.” Hawai‘i Administrative Rules, Title 13, Subtitle 5, Forestry and Wildlife, Part 2, Wildlife, Chapter 124. Honolulu, Hawai‘i.

State of Hawai‘i, Department of Land and Natural Resources. “Rules for Hawai‘i Statewide Trail and Access Program.” Hawai‘i Administrative Rules, Title 13, Subtitle 5, Forestry and Wildlife, Part 3, Na Ala Hele, Chapter 130. Honolulu, Hawai‘i.

State of Hawai‘i, Department of Land and Natural Resources. “Rules Regulating Activities within Forest Reserves.” Hawai‘i Administrative Rules, Title 13, Subtitle 5, Forestry and Wildlife, Chapter 104. Honolulu, Hawai‘i. October 1993.

State of Hawai‘i, Department of Land and Natural Resources. “Rules Regulating Game Bird Hunting, Field Trials and Commercial Shooting Preserves.” Hawai‘i Administrative Rules, Title 13, Chapter 122. Honolulu, Hawai‘i. November 1999.

State of Hawai‘i, Department of Land and Natural Resources. “Rules Regulating Game Mammal Hunting.” Hawai‘i Administrative Rules, Title 13, Chapter 123. Honolulu, Hawai‘i. November 1999.

State of Hawai‘i, Department of Land and Natural Resources. “Rules Regulating Wildlife Sanctuaries.” Hawai‘i Administrative Rules, Title 13, Chapter 125. Honolulu, Hawai‘i. 1981.

State of Hawai‘i, Department of Land and Natural Resources. “State Parks.” Hawai‘i Administrative Rules, Title 13, Subtitle 6, Chapter 146. Honolulu, Hawai‘i. June 8, 1999.

State of Hawai‘i, Department of Land and Natural Resources. “Threatened and Endangered Plants.” Hawai‘i Administrative Rules, Title 13, Subtitle 5, Forestry and Wildlife, Part 1, Forestry, Chapter 107. Honolulu, Hawai‘i. May 15, 1997.

State of Hawai‘i, Department of Land and Natural Resources. Letter to the U.S. Fish and Wildlife Service re: Draft Environmental Assessment Pre-assessment Consultation for the Hina Lani Water Transmission Line and Reservoir Modifications, North Kona, Hawai‘i. September 10, 1998.

State of Hawai‘i, Department of Transportation. *Statewide Transportation Improvement Program, Fiscal Years 2002, 2003 and 2004.* Honolulu, Hawai‘i. October 2001. http://www.state.hi.us/dot/stp/stip/stip_report.pdf

State of Hawai‘i, Housing and Community Development Corporation of Hawai‘i. Letter to the U.S. Fish and Wildlife Service re: Plant Mitigation Plan, Villages of La‘i‘opua, Kealakehe, Hawai‘i. January 6, 1999.

State of Hawai‘i, Housing Finance and Development Corporation. *Kealakehe Planned Community, Final Environmental Impact Statement.* September 20, 1990.

State of Hawai‘i, Office of Environmental Quality Control. “A Guidebook for the Hawai‘i State Environmental Review Process.” Honolulu, Hawai‘i. October 1997.

State of Hawai‘i, Office of Environmental Quality Control. “Content Guidelines for Biological Surveys, Ecosystem Impact Analysis.” Honolulu, Hawai‘i. August 11, 2000.

State of Hawai‘i, Office of Environmental Quality Control. “Definitions.” Honolulu, Hawai‘i. August 11, 2000.

State of Hawai‘i, Office of Environmental Quality Control. “The Environmental Notice.” Honolulu, Hawai‘i. Monthly.

State of Hawai‘i. Department of Hawaiian Home Lands. *Annual Report FY 2000-01*. January 2002.

State of Hawai‘i. Department of Hawaiian Home Lands. *Hawai‘i Island Plan,*. Prepared by PBR Hawai‘i. May 2002.

State of Hawai‘i. *Governor’s Molokai Subsistence Task Force Final Report*. Honolulu, Hawai‘i. June 1994.

State of Hawaii, Department of Land and Natural Resources. *Wildlife Conservation and Restoration Program Comprehensive Plan FY 2001*. April 16, 2001. Accessed at http://www.state.hi.us/dlnr/programs/wcrp/WCRP_Comp_Plan_final.htm on August 8, 2002.

Stearns, Harold T. *Geology of the State of Hawaii.* Second Edition. Pacific Books: Palo Alto. 1985.

Supreme Court of the United States, Opinion 94-859. *Bruce Babbitt, Secretary of the Interior, et al., Petitioners v. Sweet Home Chapter of Communities for a Great Oregon, et al.* June 29, 1995.

Tetra Tech Inc. Army Transformation Website. October 8, 2002. Accessed at http://www.ttsfo.com/sbcteis/general/about.htm.

The Nature Conservancy of Hawai‘i. Places We Protect. July 2002.

Thompson, Rod. “Big Island Economy Looks to Pick Up.” *Honolulu Star-Bulletin*. August 23, 2002.

U.S. Court of Appeals, Tenth Circuit. *New Mexico Cattle Growers Association, et al v U.S. Fish and Wildlife Service*. No. 00-2050. Filed May 11, 2001.

U.S. Department of Agriculture, Natural Resources Conservation Service. “Program FAQ’s.” April 18, 2002. http://www.nrcs.usda.gov/faq/programs_faq.html#program1

U.S. Department of Agriculture, Natural Resources Conservation Service. *Final Watershed Plan and Environmental Impact Statement, Waimea-Paauilo Watershed.* September 1997.

U.S. Department of Agriculture, Soil Conservation Service in cooperation with The University of Hawai‘i Agricultural Experiment Station. *Soil Survey of Island of Hawai‘i, State of Hawai'i.* Washington, D.C. December 1973.

U.S. Department of Defense, Pacific Disaster Center. Disaster Information. April 18, 2002. http://www.pdc.org/

U.S. Department of the Army, Hawai‘i. *Pohakuloa Training Area, Integrated Natural Resources Management Plan, 2002-2006 and Environmental Assessment.* August, 2001.

U.S. Department of the Army. *List of Proposed Projects to Support Transformation of 2nd Brigade, 25th Infantry Division (L), Hawai‘i.* Undated.

U.S. Department of the Interior, Fish and Wildlife Service, and National Marine Fisheries Service. *Consultation Handbook, Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act* (Final) March 1998.

U.S. Department of the Interior, Fish and Wildlife Service, Division of Economics. *1996 National and State Economic Impacts of Wildlife Watching, Based on the 1996 National Survey of Fishing, Hunting and Wildlife-Associated Recreation*. Arlington, Virginia. April 1998.

U.S. Department of the Interior, Fish and Wildlife Service, Pacific Region. *Recovery Plan for the Multi-Island Plants,* Portland, Oregon. July 1999.

U.S. Department of the Interior, Fish and Wildlife Service. *Biological Opinion of the U.S. Fish and Wildlife Service for the Saddle Road Realignment and Improvement Project*. July 27, 1998.

U.S. Department of the Interior, Fish and Wildlife Service. Cooperative Agreement with PIA-Kona Limited Partnership and Hawai‘i Forest Industry Association. September 14, 2000.

U.S. Department of the Interior, Fish and Wildlife Service. *Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Blackburn's Sphinx Moth.* 67 FR 40633 (June 13, 2002)

U.S. Department of the Interior, Fish and Wildlife Service. *Endangered and Threatened Wildlife and Plants; Designations of Critical Habitat for Plant Species From the Island of Hawai‘i;* 67 FR 36968 (May 28, 2002)

U.S. Department of the Interior, Fish and Wildlife Service. Letter to Federal Highway Administration regarding the biological opinion for the Kealakehe Parkway project. February 16, 1996.

U.S. Department of the Interior, Fish and Wildlife Service. Letter to U.S. Environmental Protection Agency re: biological opinion for the Kealakehe Effluent Disposal System. August 29, 1990.

U.S. Department of the Interior, Fish and Wildlife Service. *2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, State Oveview*. June 2002.

U.S. Department of the Interior, Fish and Wildlife Service. *Federal Aid in Wildlife Restoration (Pittman-Robertson)*. August 28, 2000.

U.S. Department of the Interior, Fish and Wildlife Service. Letter to MID Corporation. September 2, 1997.

U.S. Department of the Interior, Fish and Wildlife Service. *Palila Recovery Plan.* Honolulu, Hawai‘i. January 23, 1978.

U.S. Department of Transportation, Federal Highway Administration. *Saddle Road (State Route 200), Mamalahoa Highway (State Route 190) to Milepost 6, Draft Environmental Impact Statement.* October 1997.

U.S. Department of Transportation, Federal Highway Administration. *Kealakehe Parkway Mamalahoa Highway to Queen Ka‘ahumanu Highway, Final Environmental Impact Statement.* June 26, 1998.

U.S. District Court for the District of New Mexico. *Middle Rio Grande Conservancy District v. Bruce Babbit.* No. CIV 99-870, 99-872 and 99-1445M/RLP (consolidated).

U.S. Office of Management and Budget, The White House. “Circular No. A-94, Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs.” October 29, 1992.

U.S. Office of Management and Budget, The White House. “Executive Order 12866, Regulatory Planning and Review.” September 30, 1993.

U.S. Office of Personnel Management. 2002 General Schedule Salary Table. 2002.

University of Hawai‘i, Department of Urban & Regional Planning. *Contemporary Subsistence Lifestyles in Hawai‘i: Implications for State Policy. Part II: Conference Proceedings*. Honolulu, Hawai‘i. 1985.

Verizon Communications, Inc. Frequently Asked Questions. Accessed on September 25, 2002 at http:/www22.verizon.com/about/careers/faq.html

Wilcox, Carol. *Sugar Water, Hawaii’s Plantation Ditches*. University of Hawai'i Press, Honolulu. 1996.

Wilson Okamoto & Associates, Inc. *Final Environmental Impact Statement, Kaloko Industrial Park, Phases III and IV*. Prepared for TSA International, Ltd. October 18, 2000.

Young, John S., Dennis M. Donnelly, Cindy F. Sorg, John B. Loomis, and Louis J. Nelson. “Net Economic Value of Upland Game Hunting in Idaho.” *USDA Forest Service Resource Bulletin RM-15.* Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 1986.

Additional information was provided in communications with representatives of:

Government

— County of Hawai‘i, Department of Public Works
— County of Hawai‘i, Department of Water Supply
— County of Hawai‘i, Office of Housing and Community Development
— County of Hawai‘i, Planning Department
— Hawai‘i Department of Agriculture
— Hawai‘i Department of Business, Economic Development, and Tourism
— Hawai‘i Department of Hawaiian Home Lands
— Hawai‘i Department of Land and Natural Resources
— Hawai‘i Department of Transportation, Highways Division
— Hawai‘i Office of Environmental Quality Control
— U.S. Department of Agriculture, Farm Service Agency
— U.S. Department of Agriculture, Natural Resources Conservation Service
— U.S. Department of Housing and Urban Development
— U.S. Department of the Army
— U.S. Drug Enforcement Agency
— U.S. Fish and Wildlife Service, Pacific Islands Field Office

Private

— Belt Collins
— C. Q. Yee Hop & Co. Ltd.
— Decision Analysts, Hawai‘i, Inc. (DAHI)
— First Hawaiian Bank Trustee
— Hawai‘i Cattlemen’s Council
— Hawai‘i Information Service
— Hawai‘i Island Economic Development Board
— Hawai‘i Leeward Planning Conference
— Industrial Economics, Inc.
— Lanihau Partners
— McCandless Ranch
— One Keahole Partners
— PBR Hawaii
— PIA-Kona Limited Partnership
— Ponoholo Ranch, Ltd.
— Prudential Orchid Isle Properties
— Rana Productions, Ltd.
— S. M. Damon Estate
— The Queen Emma Foundation
— William L. Moore Planning
— Wilson Okamoto & Associates, Inc.
— Yamanaka Enterprises, Inc.

Non-profit

— Earthjustice Legal Defense Fund
— Hawai‘i Agriculture Research Center
— Kamehameha Schools
— Queen Lili‘uokalani Trust
— The Nature Conservancy Hawai‘i
— The Trust for Public Lands